

DICTIONARY OF COSTING

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THIRD EDITION



LONDON
SIR ISAAC PITMAN & SONS, LTD.

Third edition 1923
Reprinted 1938

SIR ISAAC PITMAN & SONS, LTD.
PITMAN HOUSE, PARKER STREET, KINGSWAY, LONDON, W.C.2
THE PITMAN PRESS, BATH
PITMAN HOUSE, BOUVERIE STREET, CARLTON, MELBOURNE
27 BECKETT'S BUILDINGS, PRESIDENT STREET, JOHANNESBURG

ASSOCIATED COMPANIES
PITMAN MEDICAL PUBLISHING COMPANY, LTD.
45 NEW OXFORD STREET, LONDON, W.C.1

PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET, NEW YORK

SIR ISAAC PITMAN & SONS (CANADA), LTD.
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE, 381-383 CHURCH STREET, TORONTO

MADE IN GREAT BRITAIN AT THE PITMAN PRESS, BATH
E8—(B.1965)

FOREWORD

COSTING is assuming every day greater importance in connection with industry.

Costing is comparatively a new science and it is not to be wondered at that inexactitude in terminology has crept in. To obtain the fullest value it is necessary that the language of costing be clear and definite, and I feel sure the DICTIONARY OF COSTING will be invaluable to all cost accountants and also to the student of the future.

It is becoming abundantly plain that any business which fails to set up a reliable costing system will find itself sooner or later in difficulties. Our competitors in foreign countries have gone far in this direction, and to enable competition to be successfully met both at home and abroad reliable cost data are essential. A firm without this information is not only running grave risks itself but is a menace to the industry as a whole. For these reasons I am sure the DICTIONARY will be welcomed.

GEORGE BEHARRELL

PREFACE

TO THE THIRD EDITION

INDUSTRIAL methods and procedures have made rapid progress this past few years. Costing has also kept pace with this progress and many of the methods that were considered satisfactory a few years ago have become obsolete. Principles have remained, but systems and procedures have had to be changed to meet the exacting requirements of modern management.

In revising THE DICTIONARY, no change was found necessary in regard to the already established principles of Costing, but many new principles and methods have been introduced. The importance of human relations in modern management has brought with it a demand for a more scientific method of measuring human efficiency and to determine what is fair remuneration for a fair day's work. Wage Incentives have therefore become of major importance and, owing to its close connection to Costing routine, this particular subject has been revised and expanded to include Job Evaluation, Merit Rating, Motion Study, etc. Many of the improvements in management methods, such as plant layout, planning and progress, foreman training, and technological developments in manufacturing methods and procedures, and material handling, etc., cover a much wider field than purely Costing and have not been included, but sufficient ground has been covered in the current revision to enable the Cost Accountant and Costing Student to appreciate current trends in modern industrial management.

Only very minor changes have been made in Costing terms. The terms covered in the First Edition of THE DICTIONARY were based upon the correct meaning of the words used. Terms which were then used simply because they had become common practice through usage were ignored for the simple reason that "fashions" change, and it was considered that Costing terms and definitions, like the terms used in other professions, should be based upon correct terminology. That Costing terms should be permanent is obvious if we keep in mind the needs of the Costing student as well as those of the qualified Cost Accountant.

R. J. H. RYALL

PREFACE

TO THE FIRST EDITION

NOTHING in the nature of a Dictionary of Costing has ever before been attempted, notwithstanding that the need for such a work of reference has been acutely felt for some time past.

The vast strides made in the science of Costing during the past few years, particularly in the direction of standard or predetermined Costing, have brought into use many new principles and data

There are to-day many excellent volumes which deal with a specific phase of Cost Accountancy, or describe a system peculiar to one trade only, but consequently do not give the Cost Accountant, the manager, or the student just the information he requires under any definite heading.

The author's aim, therefore, has been to produce a work which shall take its place as the standard book of reference in the Costing profession, by arranging into dictionary form a representative collection of matter covering the fundamentals of present day Cost Accountancy in such a manner that information on any desired subject may be referred to very easily.

The absence in the past of any recognized standard nomenclature or terminology in the Costing profession has been one of the greatest difficulties with which the Cost Accountant and student have had to contend, and an explanation of the general arrangement and method of indexing of this work may therefore be desirable.

The use of such terms as "Unproductive Labour," "Unproductive Materials," "Overheads" and the like have long since been discarded by most Cost Accountants for the reason that they do not correctly describe the items in question, and throughout this Dictionary an explanation or description of any subject or procedure is only given under the heading or title which is considered to be the more correct. The titles hitherto given to many of the routine forms have also been indefinite; as an instance, the term "Time Card" or "Clock Card" is commonly used, but such terms may refer to a record of the time of attendance at the factory, or

PREFACE

a record of the time spent on a particular job, operation or process—two widely differing records. An attempt has therefore been made to choose more suitable titles and to justify this choice.

The general arrangement and indexing has been effected firstly by dividing the whole subject into the three elements of cost, viz., materials, labour and expenses, and, secondly, to subdivide and analyse each of these elements into their respective detailed headings. If information is required on a specific point and some doubt exists as to what is the correct term, reference should firstly be made under "Classification of Costs," which provides the key to the analysis of the subject and the main terms that are used in connection with each of the above elements.

That no standard terminology has existed may seem curious, but with the progress of the science little or no steps have been taken to cope with this important matter, and hence the anomaly. Readers are, therefore, courteously requested to bear this fact in mind. It is hoped that a matter of such vital importance as correct terminology may receive the attention and help of those interested.

My thanks are due to Mr. C. Hanneford Smith, F.C.W.A., for the valuable assistance he has freely given in connection with the preparation of the book.

R. J. H. RYALL

LONDON, W.C.

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DICTIONARY OF COSTING

ACCOUNTING DEPARTMENT—EXPENSES OF. The expenses of the Accounting Department, which will include salaries and all office expenses, stationery, etc., form part of establishment expenses. The treatment of this item in the cost accounts will depend upon the size of the concern.

With small concerns, and in all cases where the amount of expense involved is not large, the item is best dealt with by allocating it to administrative expenses. This procedure is almost universally adopted on account of the fact that the Secretarial Department will also be merged with the Accounting Department, but with the very large concerns these departments will generally be separate and distinct, and in such cases the expense of the Accounts Department will be apportioned arbitrarily over the factory (or material expense), selling, and administrative sections of the business.

ACCOUNTS—CLASSIFICATION OF. (See CLASSIFICATION OF ACCOUNTS.)

ADMINISTRATION OVERHEAD. (See ADMINISTRATIVE EXPENSE.)

ADMINISTRATIVE EXPENSE. A subdivision of establishment expense, and only includes the expense of formulating, directing and controlling the policy, organization and operations of a business.

Administrative expense may include such items as: Salaries of directors, general manager, secretary, comptroller, cost accountant, and their respective staffs, legal expenses, directors' fees, audit fees, insurance premiums for loss of profits, bank charges, interest on debentures and bank overdraft, patent fees and expenses; the expenses of the Secretary's, Accountant's, Cost Accountant's, etc., Departments, also a proportion of the cost of lighting, heating, depreciation and repairs and maintenance of buildings, etc.; and also the salaries of general clerical staffs, when not directly chargeable to the Factory or Sales Departments.

Most of the items that constitute administrative expenses can usually be allocated direct, such as—

Salaries of directors, general manager, secretary, comptroller, cost accountant, etc., and of their respective departments.

Sundry Office Expenses of above departments.

Expenses of Capital, i.e. bank charges, interest on bank overdrafts and loans, debenture interest.

Directors' Fees, travelling expenses and salaries, etc.

Insurance Premiums other than fire, employers' liability, common law, and State, etc.

Legal Expenses, Patent Fees, Audit Fees, etc.

Examples of expenses that are usually "allocated" by apportionment—

Repairs and maintenance of buildings, if head office forms part of the main building or factory.

Lighting and heating of Administrative Departments, if head office forms part of the main building or factory.

Rates and taxes.

Postages, telephones, stationery, travelling expenses, etc., if not separately recorded.

The majority of the items that comprise the administrative expenses of a business will appear under the heading of "Constant Expenses," as they will not vary directly with the volume of output or trade done.

The total amount of the administrative expense is ascertained by preparing an "Expense Allocation Statement," and entering therein all the expenses of the business. Each item is then examined and allocated under the headings of—

1. Administrative Expense.
2. Selling and Distribution Expense.
3. Factory Expense.

Certain of the items can be allocated or apportioned direct over the Selling and Factory Departments, but those which cannot be so treated are extended in the administrative expense column, and upon completion of this work, i.e. "Allocation of Expenses," the total administrative expense is generally apportioned over the Factory and Selling Departments, according to the extent to which it is estimated each of these departments benefits by the general management.

The recovery of administrative expenses separately from the factory and sales expenses in costs can only be recommended in most exceptional instances, as the great amount of extra clerical work involved will more than outweigh any advantage that may be anticipated.

ADMINISTRATIVE EXPENSE CONTROL ACCOUNTS.
(See COST CONTROL ACCOUNTS.)

ADVANTAGES OF COST ACCOUNTANCY. (See OBJECTS AND ADVANTAGES OF COSTING.)

ADVERTISING. The expenditure incurred by a business in advertising its products should be dealt with in the cost accounts, according to how the money has been expended.

The expenditure incurred in connection with the general advertising of a firm's products is usually regarded as a general charge to selling expenses and recovered upon the total sales. When a new line is placed upon the market and the special advertising expense incurred is very large, the amount is best dealt with by being spread over a fixed quantity of goods or a definite period. In such cases it may then be recovered as a direct charge in the manufacturing cost of the products or as a special charge to the Cost of Sales Account.

The expense of advertising, when incurred to revive or increase the sales of an existing article, should be dealt with in exactly the same manner as that given above when marketing a new line.

ADVERTISING LITERATURE. (See CATALOGUES: COST OF.)

AGENTS' COMMISSIONS. (See COMMISSIONS ON SALES.)

ALL-IN COST. (See TOTAL COST.)

ALLOCATION OF EXPENSES. The work of analysing and distributing upon an equitable basis each item of expense to sub-accounts, which correspond to the groups into which the establishment expenses of a business are divided.

The actual basis upon which the expenses are allocated or apportioned to the respective sub-accounts will be determined firstly, by the nature of the item, and secondly, by the method that will be used for recovering the expenses in costs.

The work of "allocation" immediately follows that of "collection," and each of the items which have been collected and entered in the first three columns of the Expense Allocation Statement, as shown on pages 86 and 87, is examined and apportioned over the Factory, Selling, and Administrative Departments. This procedure is carried out in three stages: Firstly, there is the allocation of expenses to each of the three main divisions mentioned above; secondly, and in those cases where the administrative expense is not separately recovered in costs, to apportion this total over the Factory and Selling Departments according to the extent it is considered each benefits therefrom; and lastly, to subdivide the factory expenses to departments or processes, etc., as required by the method used for recovering such expenses in costs.

1. The main allocation of expenses is not a difficult matter, as it is only necessary to examine each item and ascertain whether it is a charge to one or more sections of the business. A detailed consideration of the more difficult expense items, and the basis of allocation, will be found under their respective headings.

Upon completion of this work the Expense Allocation Statement is totalled, and the amount chargeable to each section of the business ascertained, as shown by the following *pro forma* statements. (Forms Nos. 1, 2, and 3.)

Form No. 1.

EXPENSE ALLOCATION STATEMENT

FOR MONTH ENDING 30TH JUNE, 19.....

A/c. No.	Description.	Total.	Allocation.		
			Adminis- trative.	Selling.	Factory.
	<i>Variable Expenses</i>	£	£	£	£
A. 301	Advertising . . .	100		100	
B. 258	Branch Office Exp'ns	300		300	
B. 259	Bank Charges . .	400	400		
C. 101	Commissions on Sales	500		500	
C. 102	Carriage (Purchases)	600		100	500
C. 103	Carriage (Sales) .	700		700	
G. 59	Gas	800			800
I. 45	Insurance: National.	900	25	75	800
L. 92	Legal Expenses .	1,000	1,000		
L. 93	Lighting (Electricity)	2,000	200	400	1,400
P. 79	Printing and Station- ery	200	50	100	50
P. 80	Power (Electricity) .	3,000			3,000
S. 30	Salaries	4,500	1,500	1,500	1,500
	<i>etc.</i>				
		£15,000	£3,175	£3,775	£8,050
	<i>Constant Expenses</i>	£	£	£	£
	Depreciation, Plant and Machinery .	6,000			6,000
	Depreciation, Bldgs.	5,000	1,000	1,000	3,000
	Depreciation, Heating Plant	4,000	1,000	1,000	2,000
	Insurance, Fire, etc.	3,000	1,000	500	1,500
	Rates and Taxes .	2,000	100	200	1,700
	Salaries	3,000	1,000	1,000	1,000
	<i>etc.</i>				
		£23,000	£4,100	£3,700	£15,200

(Note. When a system of Control Accounts is in use, the entries for journalizing the above figures, so that the amount of expenses can be reconciled with the financial accounts, will be found under Cost Control Accounts (Expense Section).)

Form No. 2.

EXPENSE ALLOCATION STATEMENT

SUMMARY OF SERVICE ORDERS CHARGEABLE TO EXPENSE ACCOUNTS

FOR MONTH ENDING 30TH JUNE, 19

A/c. No.	Description.	Total.	Allocation.		
			Adminis- trative.	Selling.	Factory
		£	£	£	£
	Repairs and Main- tenance—				
S.O. 110	Plant	2,600			2,600
S.O. 120	Machinery	1,100			1,100
S.O. 130	Buildings	1,200	100	200	900
S.O. 140	Office, F. & F. . . .	1,300	300	1,000	
S.O. 150	Works, F. & F. . . .	1,400			1,400
S.O. 160	Heating Plant <i>etc.</i>	1,500	100	200	1,200
		£9,100	£500	£1,400	£7,200
		£	£	£	£
	Indirect Labour—				
S.O. 210	Supervision	100			100
S.O. 220	Shop Clerks	200			200
S.O. 230	Cleaning & Sweeping	300	50	50	200
S.O. 240	Material Handling	400			400
S.O. 250	General Labouring	500			500
S.O. 260	Viewing, Etc. . . . <i>etc.</i>	600			600
		£2,100	£50	£50	£2,000
		£	£	£	£
S.O. 310	Storekeeping	700		100	600
S.O. 420	General Purposes <i>etc.</i>	800			800
		£1,500		£100	£1,400

2. Administrative expenses may be recovered in costs as a separate item or included with the selling and factory departments' expenses, and the choice of any one method will depend upon the nature and size of the business and the statistical information which it is desired the costing system

should furnish. In those cases where these expenses are included with the selling and factory expense rates, the total is apportioned according to the extent each department benefits by the general administration of the business.

Form No. 3.

SUMMARY OF EXPENSE ALLOCATION STATEMENTS

FOR MONTH ENDING 30TH JUNE, 19.....

	Total.	Adminis- trative.	Selling.	Factory
Variable Expenses .	£ 15,000	£ 3,175	£ 3,775	£ 8,050
Constant Expenses .	23,000	4,100	3,700	15,200
Service Orders—				
Repairs and Main- tenance . . .	9,100	500	1,400	7,200
Indirect Labour .	2,100	50	50	2,000
Storekeeping, etc. .	1,500		100	1,400
	£50,700	£7,825	£9,025	£33,850

Continuing with the above figures, the allocation of administrative expenses on the basis of, say, 60 per cent to factory and 40 per cent to selling would be effected, and the summary completed as shown by Form No. 4.

Form No. 4.

EXPENSE ALLOCATION STATEMENT

FINAL SUMMARY

	Total.	Allocation.		
		Adminis- trative.	Selling	Factory.
Total Expenses, as per Summary . . .	£ 50,700	£ 7,825	£ 9,025	£ 33,850
Allocation of Adminis- trative Expenses .			3,130	4,695
	£50,700		£12,155	£38,545

3. The allocation of expenses to the various factory departments or processes, etc., will proceed upon similar lines to

that described above, and each item dealt with on its correct basis. The allocation of the majority of expenses which have been collected by means of service orders should be more or less automatic, and the system of service orders should be so arranged that wherever possible they are charged to the department incurring the expense ; for instance, the repairs and maintenance of works' fixtures and fittings may, in most cases, be charged to a separate order used for each department, as also most forms of indirect labour, sundry shop supplies, etc., but those items which cannot be so treated are apportioned upon some basis which enables the expenses to be dealt with equitably.

The preceding statements are sufficient to explain the work involved when a system of service orders is in use, as many of the expense items will be automatically analysed to departments. When service orders are not used the work of allocation will require to proceed upon different lines, as most of the items must be allocated arbitrarily or upon some definite basis. Forms No. 5 and 6 are specimens of the various allocation statements that may be prepared under such circumstances, and before a final total of the factory departments' expenses can be arrived at. It will, of course, be realized that the actual number of statements and the amount of analysis that will be required will not only depend upon the size of the business, but also the method employed for recovering expenses in costs. For instance, if the percentage on direct labour method is used, no further analysis will be required, as the total factory expense, as shown by the statement above (e.g. £38,545), will be the expense figure to use in arriving at a rate.

When factory expenses are recovered by means of a departmental rate, whether expressed as a percentage on the direct labour of each department or at a rate per direct labour hour, it is necessary to allocate all expenses to departments.

This further allocation will usually be completed by two stages, as it now becomes necessary to adjust certain of the "service" expense items between two or more of the Service Departments in addition to allocating to them a proportion of such items as repairs to buildings, lighting, heating, etc. These latter items it will be noted were analysed by means of service orders in the statements given above.

Expenses must, therefore, firstly be allocated to both Service and Producing Departments, and, secondly, after arriving at the total expense of each Service Department, to apportion them over the respective producing departments

FACTORY EXPENSE ALLOCA To Service and Pro

A/c No.	Description.	Total per Sum- mary.	Allocation.			
			Power Dept.	Repair Dept.	Raw Material Stores.	Receiv- ing.
	Repairs & Maintenance	£	£	£	£	£
S.O. 110	Plant	2,600	400			
S.O. 120	Machinery	1,100		50		
S.O. 130	Buildings	900	20	10	10	20
S.O. 150	Works, F. & F. . .	1,400	40	50	60	50
S.O. 160	Heating Plant . .	1,200				
	Indirect Labour—					
S.O. 210	Supervision . . .	100	5	5	5	10
S.O. 220	Shop Clerks . . .	200	10		10	10
S.O. 230	Cleaning, etc. . .	200	30	10	20	10
S.O. 240	Material Handling .	400		25	200	50
S.O. 250	General Labouring .	500	25	50	50	50
S.O. 260	Viewing or Inspection	600				100
S.O. 310	Storekeeping . . .	600			500	
S.O. 420	General Purposes . .	800	70	70	70	70
	Depreciation—					
	Plant	2,000	800			
	Machinery	4,000		200		
	Buildings	3,000	170	150	170	250
	Heating Plant . . .	2,000				
	Fire Insurance . .	1,500	100		500	100
	Rates and Taxes . .	1,700	100	50	100	50
	Salaries (Management)	1,000	50	50	50	50
S. 30	Salaries (Staff) . .	1,500	100		75	125
P. 80	Power	3,000	3,000			
L. 93	Lighting	1,400	1,400			
P. 79	Printing and Stationery	50				
I. 45	National Insurance, etc.	800	50	50	50	75
G. 59	Gas	800		100		
C. 102	Carriage (Purchases) .	500			500	
	Administrative Expense	4,695	200	50	200	100
		£38,545	£6,570	£920	£2,570	£1,120

TION STATEMENT. No. 1 **ducing Departments**

Allocation (<i>contd</i>)					Basis of Allocation ¹
Tool Room.	Tool Stores.	Heating.	Works Office Dept.	Pro- ducing Depts.	
£ 100 150 10 50	£ 10 60	£ 200 10 30 1,200	£ 10 60	£ 1,900 900 800 1,000	Arbitrarily or by direct analysis Charged direct to Job Costs
5 10 25 100	5 10 20 25	5 50	 60 20	60 100 80 125 225 400	Direct analysis or pro- portioned according to the number of workers in each department.
70	100 50	70		330	Arbitrarily, or by direct analysis
200 350 170	 170	400 200 2,000	 100	600 3,450 1,620	On value of the equip- ment in each department
100	50	150		500	On basis of values
100	25	100	25	1,150	On space or value of build- ings occupied
50	60	30	60	600	Apportioned arbitrarily
100			300	800	Direct Analysis
50 100	25	50	50 25	425 600	Direct Analysis
100	100	150	250	3,545	Apportioned
£1,840	£710	£4,645	£960	£19,210	

¹ For detailed information regarding the various methods by which each expense item can be dealt with see also under the heading of each expense item.

FACTORY EXPENSE ALLOCATION STATEMENT. No. 2 **Factory Expense to Producing Departments**

Form No. 6.

A/c. No.	Description.	Total per Summary No. 1	ALLOCATION—PRODUCING DEPARTMENTS.										Test.
			Turning.	Milling.	Drilling.	Planing.	Coil Winding.	Armature Winding.	Painting.	Assembly.			
			£	£	£	£	£	£	£	£			
	Repairs and Maintenance—												
	Plant	1,900	400	400	400	320	130	130	40	40	40	40	
	Machinery	900	180	180	180	210	30	30	30	30	30	30	
	Buildings	800	100	100	100	100	100	100	50	50	75	75	
	Works, F. & F.	1,000	150	175	150	50	100	75	100	100	100	100	
	Indirect Labour—												
	Supervision	60	10	10	10	5	5	5	5	5	5	5	
	Shop Clerks	100	12	12	12	12	12	10	10	10	10	10	
	Cleaning	80	10	10	10	5	10	10	10	10	10	10	
	Material Handling	125	20	20	20	20	20	15	10	10	20	20	
	General Labour.	225	40	40	40	35	10	10	10	20	20	20	
	Vermin	100	65	65	65	65	30	50	10	40	10	10	
	General Purposes	330	65	65	65	65	15	15	10	15	15	15	
	Depreciation—												
	Plant	600	105	100	100	100	50	50	20	25	50	50	
	Machinery	3,450	650	650	605	650	200	175	170	250	100	100	
	Buildings	1,620	275	250	220	250	150	180	75	100	120	120	
	Fire Insurance	500	60	65	50	30	70	65	60	50	50	50	
	Rates and Taxes	1,150	190	160	180	195	120	115	75	55	60	60	
	Salaries (Management)	600	70	70	70	50	80	60	70	70	60	60	
	Salaries (Staff)	800	100	100	100	50	100	100	50	100	100	100	
	National Insurance	425	55	55	55	60	35	45	30	55	35	35	
	Gas	600	—	—	—	—	200	200	—	200	—	—	
	Administrative Expense	3,545	650	650	605	650	200	275	170	200	145	145	
		£19,210											
	Power Department	6,570	1,350	1,475	1,350	1,225	250	310	50	210	350	350	
	Repair Department	920	160	175	160	175	30	30	30	50	80	80	
	Raw Material Stores	2,570	410	470	390	450	375	240	165	35	35	35	
	Receiving	1,120	180	200	150	130	160	150	120	20	20	20	
	Tool Room	1,840	280	250	295	290	50	50	25	275	325	325	
	Tool Stores	710	110	95	110	110	10	10	10	135	120	120	
	Heating	4,645	650	570	590	500	550	515	500	400	370	370	
	Works Offices	960	120	120	120	100	90	110	60	130	110	110	
		£38,545	£6,467	£6,532	£6,232	£5,902	£3,182	£3,120	£1,965	£2,705	£2,440	£2,440	

¹ Most of these items will be charged direct through the system of Service Orders. In some cases, Raw Material Stores and Receiving will be added to the price of materials as a percentage to cover handling.

As the amount of information that should be given on any of the above statements will be determined by the method of recovering factory expenses, there is usually inserted at the bottom of the statement containing the allocation of expenses to producing departments, the total direct labour for the period, if the percentage on direct labour method is used, or the total direct labour hours of each producing department for the direct labour hour method, and in the case of a machine rate the number of standard or normal machine hours.

When a machine rate is used, the machine tools may be grouped or arranged in "batteries" according to type, size, and output, etc. A further sub-analysis of each department's expense may, therefore, be necessary, and in such cases this sub-allocation will be carried out in a similar manner to that described above, and the expenses of each producing department allocated over the respective machine tools or gangs.

The examples of expense statements given above will not necessarily be suitable under all conditions, as they must be specially arranged to suit the requirements of each case; for instance, it is sometimes possible to combine them into two or three large statements instead of using a separate summary for each stage in the complete process of allocation.

APPORTIONMENT OF WORKS EXPENSE. (See ALLOCATION OF EXPENSES.)

APPRENTICES' PREMIUMS. The amount paid by way of premiums on behalf of apprentices is a credit to Factory Expenses.

Many firms will prefer that the administrative expenses shall receive credit for apprentices' premiums, but as the factory have to bear the expense of instruction, they should receive credit for any premiums paid. On the other hand, a company may regard the expenses attached to apprentices as a charge against profits, and in such cases the premiums may be credited to Profit and Loss Account. When the latter principle is adopted, some allowance should be made for the time given to apprentices by the factory supervision, etc.

APPROPRIATION OF STOCK. (See STOCK RECORD CARD.)

ATTENDANCE RECORD. A term sometimes used when referring to the record of attendance made by workers at the factory. (See GATE CARDS and TIME RECORDING.)

AUDIT FEES. The expense incurred in connection with the annual audit of the company's accounts and balance sheet is a charge to the administrative expenses, and the amount, together with other items of a similar nature, is

apportioned over the Factory and Selling Departments of the business.

BAD DEBTS. The treatment in the cost accounts of the amount of bad debts incurred may be in two ways. It may be regarded either as a charge to selling expense or a charge to administrative expense, and the choice of any one of these two methods will depend entirely upon the routine in regard to the passing or certifying of inwards orders for credit. If the Selling Department is responsible for this work, then the loss is a correct charge to the selling expenses, but in those cases where a separate "Credit" Department exists and is under the charge of either the secretary or accountant, the item is then a charge to administrative expense.

Care must be taken to differentiate between the amount of bad debts actually written off during the period, and any reserves created for bad debts, as the latter will not be included in the Establishment Expenses of the business.

BANK CHARGES. When charges are made by a bank for handling the account, the amount will form part of the establishment expenses and be allocated to administrative expense. The analysis of this item with a view to charging the respective sections of the business with their correct share is not recommended on account of the smallness of the amount usually involved.

BANK DEPOSIT—INTEREST ON. The inclusion in the cost accounts of the amount of interest received upon deposit accounts will depend upon the principle adopted in regard to interest on overdrafts, loans, and debentures, etc. If, therefore, the interest payable upon these latter items is included in costs, then it logically follows that interest received should form a credit in the cost accounts. In other words, if expenses of capital are an item of cost, then profits of capital should be included as a credit in costs.

When both interest receivable and payable are included, the treatment of the items may be rendered easier if an Interest Account is used, and the respective amounts debited or credited and the balance transferred to the respective expense accounts. When dealing with items of this nature, it is desirable to consider carefully the amount involved, as in a large number of cases the expense of accounting for each item separately may not be worth while. Consistency in the treatment of expenses in cost accounting is desired, but one must not completely ignore the expense of such refinement in any system.

BANK OVERDRAFT—EXPENSES OF. The amount of interest and other charges relative to overdrafts is an item of establishment expense. The basis of allocation will depend upon the amount of expense involved. When the item is only small, it is best dealt with by being allocated direct to administrative expense, but if a considerable sum is concerned, the amount may then be apportioned to the Factory (or Material Expense) Selling and Administrative Departments. It should be noted, however, that if a very large amount of interest is involved and when most of the money is used for a specific contract or purpose, the expense incurred by such contract should form a direct charge to it. (See also **DEBENTURES—INTEREST ON**; also **MORTGAGES—INTEREST ON**.)

BARTH PREMIUM—WAGE INCENTIVE. This method does not guarantee the day rate. The method of arriving at the amount to be paid is to multiply the standard time by the actual time, take the square root of the result, and multiply by the hourly rate. This can be quite easily done on an ordinary slide rule. It offers a very poor incentive for production at the higher levels, and is too abstract to appeal to the average operator. Almost its sole advantage is that there is one fairly simple formula for all stages of production. Up to 100 per cent production it is more favourable than straight piece work. The standard time for this method is extraordinarily carefully set by means of minute time studies, to such an extent that errors in rate-setting hardly ever occur.

BEDAUX SYSTEM—WAGE INCENTIVE. Mr. Charles E. Bedaux, who originated this method in 1911, states that the principle of human power measurement is that all human effort is measurable in terms of a common unit made up of effort and relaxation in proportions governed by laws controlling strain. Bedaux measurement of labour is based on the principle that all human effort may be measured in terms of a common unit, that unit being made up of a combination of work and rest, with the proportions dependent upon the nature of the effort and the subsequent relaxation required in compensation. As tasks vary, the ratio of work to rest within the unit varies, but the unit itself remains constant.

This unit is the Bedaux Unit of Human Power Measurement. For convenience the Bedaux unit is called the B, and in general terms the B may be described as the amount of work a normal man would do in one minute when working at a normal rate of speed under ordinary conditions and availing himself of his full measure of relaxation.

A B is not a minute of working time, but a minute in which work and compensating relaxation are combined in the proper proportions. In one extreme case it may be one-third of a minute of work and two-thirds of a minute rest, but the amount of effective effort in the two cases is the same.

Job No. 1 might have a cycle time of 1.2 seconds and be of such a nature as to require an allowance of 150 per cent for relaxation. Then the effort value of Job No. 1 equals 0.05 B's.

$$\frac{1.2 \text{ seconds work} + 1.8 \text{ seconds rest}}{60} = 0.05 \text{ B's}$$

Job No. 2 might have a cycle time of 4 minutes and be of such a nature as to require an allowance of 30 per cent for relaxation. Then the effort value of Job No. 2 equals 5.2 B's.

$$4 \text{ minutes work} + 1.2 \text{ minutes rest} = 5.2 \text{ B's}$$

A production of 1560 pieces an hour of Job No. 1 would represent $1560 \times 0.05 \text{ B's} = 78 \text{ B's}$ an hour. An equal amount of effective effort on Job No. 2 would produce 15 pieces an hour, since $15 \times 5.2 \text{ B's}$ likewise equals 78 B's per hour. If but 14 pieces an hour are produced, then the effective effort has been less ($14 \times 5.2 \text{ B's} = 72.8 \text{ B's}$ per hour).

The B is based upon human energy and time. It is independent of type of manufacture, product, individuals or money values.

The Bedaux plan has been applied mostly as a basis for wage incentive, and many refer to it as a wage incentive plan and proceed to analyse it as such. The originator of this system claims that this conception is basically wrong, as the Bedaux idea and principles are not primarily associated with any form of wage incentive. However, the Bedaux system affects wages in the following manner.

Earnings, to be equitable, must properly recognize two variable factors—

1. Skill, experience and responsibility required.
2. Amount of effort expended.

The Bedaux base rate covers the first point and the Bedaux premium covers the second point.

The standard day's work (an average output of 60 B's an hour) is the same for every individual, regardless of sex, occupation or wage level. The basic day's wage (hours worked multiplied by the Bedaux base rate) is fixed for each particular class of work in accordance with the nature of that work and the relative value of labour in the district.

Additional pay is given for additional effort and the amount of this added effort is measured so that no individual is unequally rewarded.

B's produced in excess of 60 per hour are termed "Premium B's." The money value of these Premium B's is equal to the base rate divided by 60, and is distributed as follows: 75 per cent to the direct workers and 25 per cent to the indirect workers.

A Premium B thus has a value to the direct worker that is 75 per cent of the full value of each of the 60 B's of standard performance. The remaining 25 per cent is credited to a premium reserve from which the premium to supervising and indirect workers is paid as it is earned. The cost per B thus remains constant, and the premium to indirect workers is paid out of economies which their own efforts so largely made possible.

BILL OF MATERIAL. A bill of material or material specification is a specification showing the quantity and description of the various kinds of materials that should enter into a given product.

Bills of material are chiefly used in connection with the manufacture of standard products, but are also employed in those industries where the kind and quantity of the materials and parts required for the manufacture of non-standard products are definitely known. The advantages obtained by the use of bills of material are many; for instance, the standardization of operations is rendered more easy, since the specifications detail the kind of materials and parts which are best suited for the product or operation. In those cases, therefore, where the production departments have the choice of using different components for a particular article, or of using different operations or processes for making the same product, the production engineers are able to select which material, components or processes to use more intelligently than is the case when the information regarding the kind of materials and processes, etc., is not available in such a ready form.

A bill of material fulfils an important function in any costing system, as it enables the storekeeper to check the stores requisition when received, and so prevent the issue of excessive materials on a production order. Stores requisitions should, therefore, quote the reference number of the bill of material, so that the storekeeper can immediately refer to his copy in order to carry out this check.

A considerable amount of clerical labour is also saved, since full details of the materials required are given on the bill of material. It will, therefore, be seen that the Cost Department's copy of the bill can often be used as the material summary for the job, and in such cases the work of entering up the stores requisitions is reduced to the posting of the actual quantities issued from stores against each item and extending the total values.

A further advantage will also be obtained in regard to the work of writing out stores requisitions. Full details of the materials required need not be stated on each requisition, as the reference number of the bill of material and the item number or numbers will be the only information needed. Upon presentation of a stores requisition made out in this manner, the storekeeper simply refers to his copy of the bill of material in order to ascertain the kind and quantity of materials that are required.

Most systems of standard costing will require the use of a system of a bill of material, as this will provide the necessary standard for material costs. In such cases the bill of material may form part of the system of authorizing production. It is not necessary, however, to compute the material cost in detail, as a bill of material will show cases where the standards have been exceeded, and the tabulation of the quantities issued in excess of the standard may be all that is required.

A specimen bill of material is shown (Form No. 7). It will be noted that suitable columns are arranged for details of all materials, together with the weight and quantity of each item. The drawing number refers to the detailed or shop drawing, which gives dimensions of the part or component and the nature of operations to be performed. The symbols S, P., M., and P.M., are used to indicate the disposition of the various items; for instance, the symbol "S." denotes that the material required is carried in stock for general production purposes; "P." signifies that the material has to be specially purchased for the order, and that no work is to be performed on it, i.e. an assembly; "M." indicates that the item is to be made; and "P.M.," which means "purchase and make," refers to materials or parts that have to be purchased, and work performed on them before they will be ready for assembly. The use of the above or similar symbols enables one to see at a glance the disposition of all the items, and in addition such information acts as a guide to the Cost Department when collecting and summarizing the cost of the job or order.

A bill of material is usually issued in sets, the number of copies being determined according to routine. The specimens given show the Cost Department copy (Form No. 7), Stores copy (Form No. 8), and Planning Department copy (Form No. 9). The copies issued to the Production Departments of a factory are ruled exactly the same as for the Cost Department, excepting that the required and issued columns are omitted and the space left blank for use in the shops.

With regard to the Stores copy, the columns on the right hand side are ruled to accommodate particulars of the stores requisition number, and the quantity or amount of materials issued. This information is entered by the storekeeper's assistant before issuing the item, in order that the check referred to above can be carried out.

In regard to the Cost Department copy, the total materials and parts required for the job are extended in the "Required" column, and upon completion of the works or production order all the stores requisitions, which have been issued against each item, may either be summarized and entered in the "Issued" column or the Stores Department copy of the bill of material may be sent to the Cost Department. The issues, as noted thereon, are checked with the stores requisitions, and the total quantities then transferred from the Stores Department copy to the Cost Department copy.

The actual method of issuing bills of material to the various departments, as also the rulings of such a form, will depend upon the special conditions which obtain in each factory; for instance, in those concerns where the products are definitely standardized, it is more convenient for bills of material which relate to standard products to be blue printed or typewritten, and in such cases the total quantity and values of materials "required" can be included on the blue print.

Bills of material, which are issued in connection with the manufacture of non-standard or special products, may be compiled by the engineers, drawing office, or other technical department and specially typed for each order, whereas with standard products the bills of material may be issued to the several departments and remain in their possession as a standing instruction.

BIN CARD. A bin card is a record card used by the storekeeper of all items of materials and goods contained in his stores, and in addition provides him with ready information as to the nature of the contents of any particular bin.

The rulings of bin cards differ according to the nature of

the management. The easiest and most effective method of providing a continuous check upon the various forms of stores losses and shrinkage is to adopt the system of perpetual check of stocks, and a very convenient method is for the storekeeper to check the contents of a fixed number of bins each day so that at least once in each year a physical check of all items in stock will have been made.

For this purpose a storekeeper is provided with a book or loose sheets ruled similar to the illustration above, and on which is recorded the results of his daily counts. "The Record of Bin Inspection," besides being the medium for recording the particulars of each bin as it is checked, also provides a log of all bins, racks, etc., in numerical sequence. Furthermore, by reference to it, one can observe in which items of stock errors most frequently occur. The cause can then be ascertained and suitable action taken.

The duties of the storekeeper and his assistants should be limited to counting the contents of each bin, and the entering on the record of bin inspection the quantity in stock and the quantity shown on the bin card. The record is then sent to the stock record clerk in the Cost Department, who should be the only person authorized to make any alteration on the bin cards should this be necessary.

The result of the actual count is compared with the stock record card, and whenever a difference occurs the detailed entries appearing on the bin card should be checked with those on the stock record card, as it frequently happens that an error is made in bringing down the "balance in stock" figures, or that the storekeeper's assistants have omitted to enter one or more of the issues.

If there is still a discrepancy (after checking and correcting the entries where necessary) it is desirable that the contents of the bin (or bins) be again counted. Any difference will now be corrected, and if an alteration in the bin card is necessitated, this should only be effected by the stock record clerk.

If the nature of the difference is such that the stock record card requires alteration as well as the bin card, it will be necessary to adjust the Stock or Material Control Accounts, and this should be done either weekly or monthly, according to requirements.

It should be noted that the above description relates to the perpetual check of stocks, which should be carried out quite independently of the general scheme of stores organization; for instance, the routine in connection with the

replenishing of stocks should be such that whenever an item has reached the "re-order" or "minimum" level, the storekeeper should check the balance of the item in stock before making out his purchase requisition. This method provides an additional check upon the stores and office records, as the purchase requisition will be sent to the stock record clerk, who checks and then initials the requisition before it is passed on to the Purchasing Department.

BIN TAG. (See BIN CARD.)

BONUS EARNINGS—RECORD OF. (See PREMIUM OR BONUS EARNINGS: RECORD OF.)

BONUS FOR GOOD TIMEKEEPING. A bonus is very often paid to the workpeople in order to encourage good time-keeping, and the expense incurred in this direction is charged to the factory expenses. In those cases where departmental rates are used for recovering expenses, the amount paid in bonus should be allocated to each of the factory departments.

Bonuses paid to members of the office staff should be allocated to the administrative and selling expenses.

BONUS ON OUTPUT. The amount of bonus paid on output to the works manager or other factory officials is dealt with by either of the following methods—

1. When the bonus paid varies in amount with each class of product, it is a direct charge to each class, but in those cases where such products are being continuously made throughout the year it is then usual to charge the bonus to a special account, and apportion the amount over the whole output for the period.

2. A general bonus paid on the whole output of a factory may more conveniently be charged to the factory expense.

As the object of a bonus on output is to reward the factory officials for increased output, it is more correct to calculate such bonus as a rate per article, per operation, or per process, and not as a percentage rate upon the factory cost of the output. With this latter method an increase in cost may bring about an increase in bonus, although the quantity of articles produced may be less; conversely a reduction in cost brought about by improved methods and increased output would reduce the amount of bonus. It will be seen, therefore, that a bonus on output, and calculated as a rate per article or operation, etc., should be co-related to the prime or factory cost.

BOOKING TIME TO JOBS. The principal requirement of

cost accountancy is accuracy, and any system must have for its foundation a reliable source of information.

In almost every instance the checking and analysing of the "time spent on the job" can only be done successfully by the aid of mechanical time recorders. When the process method of cost finding is used, it may not always be possible to allocate or analyse each man's time with the same degree of accuracy as with the job costing method, as a worker may be engaged upon two or more operations at the same time, and in the majority of these cases his time can only be apportioned over the respective jobs.

In the chemical industry, for instance, a worker will often be in charge of several mixers or grinders, and his time cannot be definitely booked to each job or batch of work going through the several machines.

The method that will be used by any concern for booking time to jobs, operations or individual products will obviously differ in each case as the nature of the product, the method of payment, and the general scheme of works organization will each require consideration before a detailed system can be evolved.

The principles underlying the variety of methods that are used can be grouped under the following headings—

Method No. 1. Combined Job and Gate Card—each worker provided with only one card for the pay week, and on which is recorded the times he enters and leaves the factory, also the time "on" and "off" each job.

Method No. 2. Combined Job and Gate Card—each worker provided with only one card for the pay week as with Method No. 1, but in addition there is used a master card for summarizing the labour cost of all the workers engaged on each job or order.

Method No. 3. Combined Job and Gate Card—each worker being supplied with a separate card for each job or order on which he is engaged throughout the pay week. The times spent on each job and as shown by each card are entered on a summary in order to ascertain the total time for the pay week

Method No. 4. Separate Gate Card and Job Cards—each worker provided with a separate job card for each job or order on which he is engaged.

Method No. 5. Separate Gate Card and One Job Card for Week—each worker supplied with only one job card for use through the pay week.

Method No. 6. One Job Card for Each Order—one job card used per job or order when a series of standard operations are performed, used either with or without a gate card.

Method No. 7. Combined Job Card and Machine Running Card—one job card per machine tool per week for analysing operator's time to each job, which also shows "time on production" and "idle time" of each machine tool.

Method No. 8. Booking Time Direct on Works Instruction Sheet or Work Ticket.

The choice of any of the above methods will depend upon the three points already mentioned, and one will usually find that two or more of the methods will be used by the same factory.

When selecting the most suitable method or methods, it is sometimes necessary to classify the work that has to be performed; for instance, in most cases indirect workers will usually require a different method to direct workers; furthermore, the classification of direct workers may also show that a particular department will require a different method to the remainder.

Having selected the correct basic principle for the particular factory, the designing of a suitable card will depend upon the method of remunerating the workers, also whether instructions regarding the work that has to be performed will be contained on a separate instruction sheet or work ticket or combined with the job card.

Many other matters will require careful consideration, depending upon the nature of the trade which is being carried on, but the above few remarks will be sufficient to indicate the more important factors that must be examined when selecting and installing a time booking system for the job or process methods of cost finding.

Booking Time to Jobs---Methods of. The number of methods which are available for analysing the times spent by each worker upon a job, operation or process is so great that it is only possible to deal with the subject in dictionary form by classifying the methods into their principal groups and by giving only one example of each group. The actual method best suited for any particular factory will entirely depend upon the nature of the industry being carried on, the general scheme of works organization and production control, also the method or methods by which the workers are remunerated. Therefore the description of the various methods given below is only

intended to serve as an explanation of the principles underlying each group rather than to indicate the only way each method can be employed.

The variety of methods are classified into two main groups—

Group I, consisting of those methods that make use of a combined gate card and job card; and

Group II, comprising the methods that require the use of separate job cards, the “in” and “out” times being recorded at the “gates,” and the time “on” and “off” each job recorded in the respective departments.

GROUP I

Method No. 1. Combined Job and Gate Card. With this method each worker is supplied with a combined job card and gate card for each pay week. The card is ruled similar to Form No. 12, and upon each worker entering or leaving the factory premises, mornings, midday, and evenings, he clocks “in” and “out” respectively, and so provides a record of attendance as would be done if separate gate cards had been used.

When commencing work upon a job the job or works order number is inserted in the left-hand column, and the worker clocks “on” and either retains his card or places it in a “Jobs in Progress” card rack. On completion of the task the worker clocks “off,” and the process is repeated for each job throughout the week.

The times on each job can be extended either daily or at the end of the pay week, and in those cases where a job is unfinished at the end of the week, the time is shown separately at the foot of the card and the figure transferred to the summary which appears on the back of the new week’s card and entered in a “Brought Forward” column. The time worked on this particular job during the next week is then entered in the column “This Week,” and should the job be finished during this second week the two figures are added and the total entered in the “Jobs Finished” column. In those cases where a job may extend beyond this second week the total time is shown in the “carried forward” column and transferred to the next week, and so on until the work is completed, when the final total is entered in the “Jobs Finished” column.

The total time on each job is entered in the fourth and

BOO]

DICTIONARY OF COSTING

[BOO

Form No. 12.

No.		Name C. GLEDHILL BROOK					
3095		Week ending 27 MAY 1949					
JOB No	IN-ON	OFF-OUT	JOB TIME	OVER TIME	DAILY TIME		
2495	7-30M 12-42 Σ 7-30Tu	12-00M 5-00 Σ 11-14Tu	12.32		8.48		
2817	11-14Tu 12-42 Σ 7-30W 12-42 Σ 7-30Th 12-42 Σ	12-00Tu 5-00 Σ 12-00W 5-00 Σ 12-00Th 3-30 Σ	21.10		8.48 8.48 8.48		
3025	3-30 Σ 7-30F 12-42 Σ	5-00 Σ 12-00F 5-00 Σ	10.18		8.48		
		Hours	Mins.	Rate	£	s.	d.
Ordinary Time		44	-	3/-	6	12	0
Overtime							
Extra Time							
TOTAL							
Deduct		Nat. Ins	Sub.	Inc. Tax			
		4/11		5/1		10	0
A.M. Upright Letter P.M. Horizontal Letter				AMOUNT TO PAY £	6	2	0

fifth columns, whereas the daily time is entered in the column on the extreme right of the card.

The method is very simple and inexpensive to work, and should give very good results in those cases where long runs are made on a particular operation or process or where jobs are completed by one man, but when several workers are engaged upon the one job it is desirable that the times of the respective workers be summarized on to a "Cost Summary Sheet" in order that the direct labour cost can be easily and quickly obtained.

If times are extended each day, the total time spent on each job can easily be ascertained. In large concerns using this method the time recorders should be located in each department.

Method No. 2. Combined Job and Gate Card. This method is similar to No. 1 above, but the ruling of the card, Form No. 13, allows for the time "in" and "out" to be recorded in a separate column to the starting and finishing times of the job.

With this method it is usual for a work ticket, similar to Form No. 14, to be issued containing instructions as to the nature and quantity of the work to be done.

As each worker enters or leaves the factory, he clocks "in" or "out," as the case may be, in column No. 4, in just the same manner as described for Method No. 1. The registering of the times "on" and "off" each job will also be done as detailed above, but in this instance the works order number as shown on the work ticket is inserted in column No. 1, and the time "on" will appear in column No. 5. Upon completion of the job the worker clocks "off" in column No. 6, and the same process is repeated throughout the week for each works order. At the end of the pay week the total time as shown by column No. 4, which represents the attendance at the factory, is extended into columns Nos. 7 and 8, and the total amount of pay ascertained and the summary at the foot of card completed.

The times spent on each job are extended either daily or weekly into columns Nos. 9 and 10, and the totals for each works order number posted to a job cost summary sheet.

Unfinished jobs are dealt with in a slightly different manner to that described for Method No. 1, and instead of a "brought forward" item appearing on the card (Form No. 13) the part time is posted to the job cost summary sheet, together with the other times as shown on the specimen summary Form No. 15.

This method is specially suitable in all cases where a worker

Form No. 13.

No.		Name		C. GLEDBROOK		
13		Week		29 APRIL 1949		
JOB CARD	ATTENDANCE IN & OUT	JOB START	TIMES STOP	ORD	TIME ON JOB	Wage Cost
405	7-30M	7-30M	7-53M		0 23	1-2
489	12-00M 12-42 M 5-00 M	7-53M		8.48		
	7-30Tu 12-00Tu 12-42 E		1-19 E		13 32	40-7
610	5-00 E	1-19 E		8.48		
	7-30W		10-49W		7 00	21-0
617	12-00W 12-42 M 5-00 M	10-49W		8.48		
	7-30Th		8-25Th		6 24	19-3
		8-25Th				
632	12-00Th 12-42 M		4-44 M		7 37	22-10
		4-44 M				
683	5-00 M			8.48		
	7-30F 12-00F 12-42 M		2-17 M		6 21	19-0
H. 114	5-00 M	2-17 M		8.48	2 43	8-2
Rate	3/-			44	44 0	6/12/

Form No. 14 (front).

WORK TICKET

ORDER No.	DESCRIPTION OF ORDER	Moved AFTER INSPECTION BY
DESCRIPTION OF PART.	OPERATION.	OPERATION No.
At MACHINE.	Moved FOR INSPECTION TO	AFTER INSPECTION Move TO
		AFTER MOVING AS INSTRUCTED RETURN THIS TICKET TO PROGRESS DEPARTMENT.

Form No. 14 (back).

WEEK ENDING.....									
Quantity Passed.					Quantity Rejected.	Date.	Examined by		
WORKER'S NAME.							No.		

Form No. 16.

Form No. L.C. 761

No. 64
 Name B. Banks
 Job No. 2495
 Description Am. Supts. Supt.
 Block No. 75
 Week ending 7th June 19 19

DAY	ON	OFF	ON	OFF	Total
Th	8 00	12 30			4 30
F	1 30	5 00			3 30
F	8 00	10 30			2 30
S					
Sun					
M					
T					
W					

Hours	Rate	S	S	S	End Cost Book
10 1/2	7-	1	1	-	50 1/2
Beats					
Charge Hand					<u>Imash</u>

Form No. 17.

Form No. L.C. 761

No. 64
 Name B. Banks
 Job No. 3091
 Description Banks X 91
 Block No. 74
 Week ending 7th June 19 19

DAY	ON	OFF	ON	OFF	Total
Th					
F	10 31	12 30			2 0
F	1 30	5 00			3 30
S	8 00	12 31			4 30
Sun					
M	8 00	11 15			3 15
T					
W					

Hours	Rate	S	S	S	End Cost Book
13 1/2	7-	1	6	6	50 1/2
Beats					
Charge Hand					<u>Imash</u>

Form No. 18.

Form No. L.S. 751

No. 64
 Name B. Banks
 Job No. 4298
 Description Am. Supts. Supt.
 Block No. 76
 Week ending 7th June 19 19

DAY	ON	OFF	ON	OFF	Total
Th					
F					
S					
Sun					
M	11 15	12 30			1 15
T	1 32	5 00			3 30
W					

Hours	Rate	S	S	S	End Cost Book
4 1/2	7-	9	6		50 1/2
Beats					
Charge Hand					<u>Imash</u>

registers his time "off" the job and "on" to the next, Form No. 18, and so on throughout the pay week.

During the week the cards of the completed jobs are passed into the Wages or Cost Department and sorted into order of

Form No. 19.

CLOCK NO. <i>64</i>		PAYWEEK <i>7th June 19--</i>		
NAME <i>A. Breach</i>				
WEEKLY PAY SUMMARY				
WORKS ORDER NO	HOURS	£.	s	d.
<i>2495</i>	<i>10.30</i>	<i>1</i>	<i>18</i>	<i>6</i>
<i>3091</i>	<i>13.15</i>	<i>2</i>	<i>8</i>	<i>7</i>
<i>4298</i>	<i>4.45</i>		<i>17</i>	<i>5</i>
<i>4301</i>	<i>11 -</i>	<i>2</i>	<i>-</i>	<i>4</i>
<i>4419</i>	<i>5 -</i>		<i>18</i>	<i>4</i>
TOTAL HOURS @ <i>3/8</i>	<i>44.30</i>	<i>8</i>	<i>3</i>	<i>2</i>
DEDUCT NAT. INS.	<i>4/11</i>			
INCOME TAX	<i>7/-</i>		<i>11</i>	<i>11</i>
NET PAY.	<i>£</i>	<i>7</i>	<i>11</i>	<i>3</i>

clock number or names of workers, and the times entered upon a weekly pay summary ruled similar to Form No. 19. At the end of the pay week, which will be Thursday in the example chosen, all the cards relating to jobs still in progress are collected and the total times spent on the unfinished jobs ascertained and entered upon the summary. These cards may then be returned to their racks for use during the next week, as new cards need only be issued for jobs in progress

when all the space has been used. Alternatively, a new card can be issued for the new pay week.

The advantage of this method lies chiefly in the direction of convenience in having the "in" and "out" times on the same card as the "on" and "off" times of each job, as in such cases reference to other cards is unnecessary when ascertaining whether a worker was absent, came in late, or left early during the period of any job.

GROUP II

Method No. 4. A Gate Card and a Separate Job Card for Each Task on which the Worker is Engaged. This is a method that is very commonly used for ascertaining the labour cost of both direct and indirect work, because it is possible to vary the details of the system by departments or sections, when found necessary, and without affecting the routine of the remaining departments.

In the case of large factories it may be necessary to install two sets of time recorders, as the routine in connection with the booking of time to jobs, etc., will be carried out quite independently of the attendance times which may be recorded at the gates or entrance to the plant. In the case of the job cards, it will usually be desirable that time recorders be installed in each department or other suitable position, so that the actual process of time recording can be carried out expeditiously and under strict supervision.

The procedure in regard to the booking of the "in" and "out" times at the "gates" must be arranged to suit the special conditions of each factory, but whichever system is adopted it can generally be arranged in such a manner that the routine in connection with the job cards is worked independently up to the point where the total times spent on the various jobs is compared and checked with the total time as shown on the gate cards.

The specimen forms, Nos. 20, 21, and 22, clearly indicate the method, each worker registering his "in" and "out" times on the gate card, and the start and finish of each job on separate job cards. As each job is finished the job card is sent to the Wages or Cost Department, where all are extended, checked, and temporarily sorted either by clock number or worker's name. At the end of the pay week the gate cards are collected (being replaced with new ones) and the "in" and "out" times extended and totalled as shown on Form No. 20. The back of this card is ruled so that all of the job

Form No. 20.

Workman's Number		CATE CARD.		IN		OUT		19--	
3750		Dept. <u>Building</u>		IN		OUT		19--	
Name <u>P. Adams</u>		Week Ending <u>11-Mar</u>		IN		OUT		19--	
800M	1231Z	11	11						
129Z	531Z	11	11						
80016	1231Z	11	11						
130Z	531Z	11	11						
800W	1231Z	11	11						
129Z	531Z	11	11						
759TH	1231Z	11	11						
130Z	531Z	11	11						
758F	1231Z	11	11						
129TH	532TH	11	11						
755SA	1202Z	11	11						
Total for Week				HOURS		RATE		AMOUNT	
Ordinary Time				46		3/8		8 10 6	
Overtime									
Extra									
Deduct:									
NAT IN S.				4/11		8 10 6			
INCOME TAX				7/1		11 11			
TOTAL \$						7 18 7			

Form No. 21.

Check No.	Name	Rate	Shift	ON	OFF	1	2	3	4	5	6
3750	P. Adams	240Z	1	801M	240Z						
3750	P. Adams	400Z	1	240Z	400Z						
3750	P. Adams	1155SA	1	400Z	1155SA						

Form No. 22.

THIS SIDE TOWARDS YOU.		WAGE ANALYSIS.		TOWARDS THIS SIDE	
Check No.	Name	Rate	Shift	ON	OFF
3750	P. Adams	240Z	1	801M	240Z
3750	P. Adams	400Z	1	240Z	400Z
3750	P. Adams	1155SA	1	400Z	1155SA

GATE CARD

No 1095

Name P. H. LIGHTBODY

Week ending 29 APRIL 1949

DAY	IN	OUT	IN	OUT	TOTAL	
A.M. Sa P.M.						
A.M. Su P.M.						
A.M. M P.M.	7-30 M 12-42 Ξ	12-00 M 5-00 Ξ			8.48	
A.M. Tu P.M.	7-30 Tu 12-42 Ξ	12-00 Tu 5-00 Ξ			8.48	
A.M. W P.M.	7-30 W 12-42 Ξ	12-00 W 5-00 Ξ	5-30 Ξ	7-30 Ξ	10.48	
A.M. Th P.M.	7-30 Th 12-42 Ξ	12-00 Th 5-00 Ξ			8.48	
A.M. F P.M.	7-30 F 12-42 Ξ	12-00 F 5-00 Ξ			8.48	
Ordinary Time		Hours	Rate	£	s.	d.
		46				
		$\frac{1}{2}$				
Overtime						
TOTAL		46 $\frac{1}{2}$	3/-	6	19	6

cards can be summarized thereon and the times booked to the various jobs agreed with the total time as shown on the gate card. (Form No. 20.)

When this method is used for work on service orders, each job card may be ruled off and used again during the following weeks until filled up. Similarly, the last card used by direct workers on a works order may be ruled off and returned to the worker, who continues with the card until the job is finished. Alternatively, a fresh card is issued for all jobs in progress at the end of each pay week.

Method No. 5. Separate Gate Card and One Job Card per Man per Week. This method is very similar to Method No. 1,

Form No. 24.

JOB CARD

Name <i>J. Ronald</i>		No <i>1095.</i>		TIME RECORD.			
Job	Rate	Operation	Rate	s	d.	Stop	
						Stop	FR 945
						Start	FR 830
295	8 ⁶	<i>Drilling</i>	1/6	13	10 1/2	Time	9 1/2
						Stop	FR 4 01
371	9 ⁴	-	1/6	7	0 1/2	Time	5 1/2
						Stop	W 3 30
390	9 ⁴	-	1/6	18	-	Time	12.
			15.0 1/6	20	3	Stop	W 12 00
507	12	-	2.0 1/6	3	9	Start	W 3 30
				24	-	Time	15 1/2
						Stop	W 5 30
569	12	-	1/6	6	9	Start	W 12 03
						Time	4 1/2
						Stop	
						Start	
						Time	
						Stop	
						Start	
						Time	
						Stop	
						Start	
						Time	

Jobs—

and each worker records his "in" and "out" times on a separate gate card. The recording of times on jobs is done independently of the gate cards, as it will usually be desirable to place the time recorders in the departments. Forms Nos. 23 and 24 are given, which show the "in" and "out" times of worker No. 1095 recorded on a gate card, and the starting and finishing times of each job recorded on a job card which remains in use throughout the pay week.

The method may be found useful for small repair shops and in all cases where jobbing work is undertaken. With the larger factory, however, it is not very suitable, as the cost of each job cannot be compiled from day to day.

In those cases where this daily costing is not necessary, it still has the objection that the work of summarizing and compiling job costs in the Cost Department is rendered difficult owing to the fact that the record of each worker's time on the various jobs is contained on the one job card. (See Form No. 24.)

Method No. 6. One Job Card per Order. A method that is sometimes used when a series of standard operations are performed on an order and when it is desired to record all the labour costs on the one card. A specimen job card is shown, Form No. 25, from which it will be noted that the workmen performing each of the operations record their time on the card which remains with the order until completed. When the first man has finished his particular task he (or the foreman according to routine) clocks "off," and the card is sent with the work to the view room or Inspection Department. After the first operation has been inspected and passed, the work is issued for the next operation, together with the same job card, and this procedure is followed until completion of the order.

The checking of the times as shown on the gate cards of each worker, with the times spent on each job in order to ascertain whether all time is accounted for, is one of the greatest objections to this method. However, if the process method of cost finding is in operation, a great deal of time is saved when compiling labour costs of the job or process if the one card per job, or series of processes, etc., is used. The method can also be adopted with advantage in certain cases where a system of job costing is in use.

Method No. 7. Combined Job Card and Machine Running Card. The illustration, Form No. 26, shows a job card arranged to record the time a machine tool is occupied on each order. The cards are operated in much the same manner as

Form No. 25.

JOB CARD

Job No. 738.		Date May 21 st 19—			
MAN'S No.	OPERATION	RATE	S. D.		
305	make sheet view cover to template	2/1	3 -	Stop	FR 930
				Start	FR 800
				Time	1.30
29.	slaps & fittings	1/10	4 7	Stop	FR 1200
				Start	FR 932
				Time	2.30
118	drilling	11 ^s	1 2	Stop	FR 215
				Start	FR 100
				Time	1.15
567	Riveting	2 1/2	2 6	Stop	FR 425
				Start	FR 216
				Time	2.0
201	Painting	8 ^s	8 1/2	Stop	FR 530
				Start	FR 425
				Time	1.5
			—	Stop	—
				Start	—
				Time	—
				Stop	—
				Start	—
				Time	—
				Stop	—
				Start	—
				Time	—
TOTAL			11 11 1/2		

I.T.R. Co. Ltd. 57 City Road,
Finsbury, London, E.C. 1

Form No. 26.

MACHINE RUNNING CARD

AUTOMATICS		Machine No.	
Operator.			
Week Ending			
Job No.	Productive	Idle	Hours Productive
3095	800TH 23 JY		36 ³⁰
	401E 28 JY		
4002	404E 28 JY	401E 28 JY	4 ³⁰
	1100W 29 JY	404E 28 JY	
G1-61x		1100W 29 JY	1 ¹⁵
		1215E 29 JY	
4002	1215E 29 JY		1 ³⁰
	245E 29 JY		
G1-62x		245E 29 JY	2 ⁴⁵
		531E 29 JY	
TOTAL HOURS			42 ¹⁵
Chargeable	Time	Rate	£ s. d.
3095	36 ^{1/2}	3/6	6 7 9
4002	11 ^{1/2}		
.	1 ^{1/2}	3/6	1 1 0
TOTAL	42 ^{1/2}	£	7 8 9

for Method No. 5, the mechanic or foreman clocking "on" and "off" when starting and finishing each job. If a breakdown or delay occurs, the job is registered "off" and the machine registered (on the same card) on to a service or standing order, according to the nature of the breakdown or delay, and when the machine or work is ready, the standing order number is checked "off" and again "on" to the job; likewise, if a fresh job is not ready immediately the last order is completed, the machine is clocked "on" to a standing order.

By this means the idle time of each machine tool is collected on the same card. However, a separate idle machine card may be used if desired.

On referring to Form No. 26, it will be observed that job No. 3095 was commenced at 8 o'clock on Thursday and completed at 4 p.m. Tuesday. Job. No. 4002 commenced at 4.4 p.m. same day and, owing to a breakdown occurring on the Wednesday, the machine was idle from 11 a.m. to 12.15. On completion of this job, Wednesday, at 2.45 p.m., the machine was again idle for the remainder of the day, due to a shortage of material.

The method is specially suitable in certain cases where a more or less standardized output obtains, and where a mechanic attends to two or more machines, the object being to time the machines rather than the worker.

Method No. 8. Booking Time Direct on to the Works Instruction Sheet or Work Ticket. With some of the above methods it is not possible to give full particulars of the work to be performed on the job cards, consequently a work ticket must be used and in certain instances the time spent on each job can quite conveniently be recorded on the same form. This method is particularly suitable for small and in some cases large repair shops, garages, and where the same man completes the one job. A specimen work ticket is given, Form No. 27, which is sufficient to indicate how the method is operated in the case of a repair shop. The work tickets are collected in just the same manner as is done with job cards, and the total times summarized as described for Method No. 3. (See also TIME SHEET.)

BOUGHT OUT SUPPLIES—REJECTION OF. (See GOODS RECEIVED: REJECTION OF.)

BRANCH STORES. (See STORES ORGANIZATION AND LAYOUT, also STORES TRANSFER NOTE.)

BRANCHES OF COST ACCOUNTANCY. (See OBJECTS AND ADVANTAGES OF COSTING.)

Form No. 27.

WORK TICKET		Workman's Name..... <i>G. Williamson</i>
Date Issued <i>16th June</i> 19 ..	No. .. <i>375</i> Dept.. .. <i>Repair</i>	
DESCRIPTION OF WORK.		
<i>Generally overhaul ignition and lighting system. Car YZ 3095.</i>		
Order No. <i>2901</i>	STOP.	
Elapsed Time <i>2 51</i>	June 10, 19 <i>9.47</i> ..	
RATE	AMOUNT.	START.
..... <i>2/-</i> <i>5 : 9</i>	June 10, 19 <i>6.56</i>
APPROVED—		
..... <i>H. G. Harris</i> Foreman.		

BROKERAGE AND COMMISSION ON ISSUE OF NEW SHARES. All expenses incurred in regard to the issue of shares, etc., are a direct charge to Profit and Loss Account, and the amount is not included in the cost accounts.

BUDGETARY CONTROL. A method of controlling expenditures by the aid of budgets. Expenditures covering labour, materials, and expenses are estimated and a budget prepared with the object of keeping all disbursements within the predetermined figures.

The efficiency of budgetary control mainly depends upon the following factors: (a) Whether budgets are applied to all or only parts of a business; (b) the care taken in their preparation, and (c) the degree of control exercised by the management.

Budgetary control can be applied to the small or very large concerns with equal results, but no system of budgets will be satisfactory if proper control is not exercised. It is useless to spend time and money in preparing budgets if the means of enforcing them is not provided in the system. Carelessness in the preparation of the budgets is frequently the cause of failure in any budget scheme, and unless one is prepared to approach the subject in a thorough and efficient manner the results will never repay the efforts expended.

In the past, budgetary control has been applied with varying degrees of effectiveness, chiefly because the principle of budgets has generally been applied to one or a few divisions of the business and the term Budgetary Control is now used when referring to the method which is operated in this modified form.

Budgetary Control has developed considerably since it was first introduced many years ago, and there has now been brought into use a method that provides a very definite form of business management and control, and to distinguish it from simple budgets is known as Management Through Accounts. In general, the difference between the two methods can be explained as follows. Whereas Budgetary Control can be applied to one or more divisions of a business, Management Through Accounts is a method of management where a standard of performance in **all** divisions of a business, i.e. manufacturing, selling, and financial, etc., is predetermined *and enforced*.

As regards Budgetary Control, the principles involved in the preparation of budgets is fully dealt with under the heading of "Management Through Accounts," and to avoid repetition the reader is referred to that subject, also to

Standard Costing for details of the routine in connection with the control of standards through the costing system.

The extent to which one will need to control detailed costs, etc., will depend upon many factors, chief of which being the type of industry and the amount of control that can be exercised. With the small and well-organized plants, control can frequently be effected by groups of items or by some other simple method; the larger concern usually adopting a method whereby the control is applied at the centre of production, and in such cases detailed costs are only necessary in special circumstances. (See MANAGEMENT THROUGH ACCOUNTS and STANDARD COSTING.)

BUILDERS' COSTING. (See TERMINAL COSTING.)

BUILDINGS—DEPRECIATION OF. The amount of depreciation on buildings forms part of establishment expenses, and the items allocated to the factory, selling, and administrative sections of the business on the basis of space occupied. The extent of this analysis will be determined by the method used for recovering expenses in costs, as when departmental rates are employed the amount of depreciation relating to the factory will necessarily require further analysis. (See also DEPRECIATION.)

BUILDINGS—REPAIRS AND MAINTENANCE OF. The total cost of repairing and keeping in good order all premises is ascertained by charging all the expenditure to a Buildings Repairs and Maintenance Account, and the total is then allocated either arbitrarily or by direct analysis to the respective Factory and Office Departments.

The expense of building repairs may either be obtained by means of a system of service orders or allocated direct, as in the case of small concerns.

When a system of service orders is in use, the expense should be analysed by departments where possible; alternatively, and when the factory consists of several separate buildings, the practice is to allocate the expense to each building.

In the latter case the total cost of repairs for the period is apportioned over the respective departments, according to the cubic area occupied. When a machine rate is used for recovering factory expenses in costs, the amount of repairs and maintenance of each department may be further analysed to each machine tool or group of machines on the basis of space occupied.

When dealing with machine rates, it is often a convenience if such items as lighting, rates, repairs and maintenance, etc.,

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When a system of service orders is in use, the expense should be analysed by departments where possible; alternatively, and when the factory consists of several separate buildings, the practice is to allocate the expense to each building.

In the latter case the total cost of repairs for the period is apportioned over the respective departments, according to the cubic area occupied. When a machine rate is used for recovering factory expenses in costs, the amount of repairs and maintenance of each department may be further analysed to each machine tool or group of machines on the basis of space occupied.

When dealing with machine rates, it is often a convenience if such items as lighting, rates, repairs and maintenance, etc.,

be grouped and apportioned as one total on the above basis. (See **REPAIRS AND MAINTENANCE** and **SERVICE ORDERS**.)

BURDEN. (See **ESTABLISHMENT EXPENSE**.)

BURGLARY INSURANCE. The amount of the premiums paid in connection with the insurance of stocks against burglary forms part of the establishment expenses of a business, and its treatment in costs will depend upon whether one cares to regard this item as a general administrative charge or a charge against the stores.

In the case of the latter, the expense will require to be separated, so that both the stocks of raw materials and finished parts, etc., and merchantable stocks are each charged with their correct proportion.

The insurance premiums on stocks of materials held for manufacturing purposes will, therefore, be charged to factory expenses or Material Expense Account, whereas the premiums on saleable stocks may be charged to selling and distribution expenses if the Sales Department are responsible for such stocks.

In the majority of cases the cost of burglary insurance is usually allocated direct to administrative expense. (See also **FIRE INSURANCE**.)

BUYER—SALARY OF. The salary paid to the buyer or purchasing agent forms part of the establishment expenses of a business, and the treatment in the cost accounts of this item will depend upon the manner in which all expense incidental to the purchasing and handling of materials is dealt with. In those cases where such expenses are segregated from those which relate solely to production, the expenses of the Purchasing Department, and which include the salary of the buyer, will be allocated to a Materials Handling Expense Account, and the total of this expense item recovered in costs as a percentage on the value of materials consumed in production.

With most concerns, however, the expenses of purchasing and storekeeping, etc., are included among establishment expenses and allocated to the Factory Departments, but in those cases where a merchanting as well as manufacturing business is carried on, the expense of the Purchasing Department should be charged to the Factory and Selling Departments either on the basis of the value of purchases made or arbitrarily apportioned, according to the extent it is estimated each section of the business benefits by the activities of this department.

It must be noted that when a merchanting business is also carried on, the expense of storekeeping and material handling, etc., should be dealt with separately from the expenses of purchasing, as the basis of allocation or apportionment in such cases may more correctly be the value of stocks or merchandise held rather than the value of purchases made on account of the fact that merchandise may be shipped direct to customers or re-dispatched the same date as received.

BUYING DEPARTMENT. (See PURCHASING DEPARTMENT.)

BUYING—ROUTINE OF. (See PURCHASING.)

BY-PRODUCT COSTING. By-products arise in most of the continuous process industries, and the apportionment of the expenditure incurred between the main product and the by-product at the point when the latter is separated from the former, presents one of the greatest difficulties in connection with process costing.

A manufacturing process may proceed up to a certain stage, when the liquid, solid or gas which is being dealt with becomes divided or formed into two or more distinct products.

Up to the point of this separation no difficulty is experienced in recording the cost of the process, as the total expenditure is chargeable to the process or one product. Immediately a separation takes place, however, it is necessary to apportion the cost over the two or more products.

It is only in very exceptional cases that the expenditure relating to a by-product can be definitely measured or allocated to it, consequently logical apportionment must be resorted to in the majority of instances.

The basis of apportionment may be the sales or market price of the main product and by-product, the yield or arbitrary values assigned to the products at the time the separation occurs.

The choice of a basis will generally be determined by the sales value of the by-products, as it is not desirable that a considerable amount of clerical work be undertaken when a by-product can only be disposed of at, say, a few shillings per ton. On the other hand, the by-products may have a fairly high market value, and in such cases a more accurate but reasonable apportionment should be made.

In order to indicate the general principles of by-product costing it is necessary to pre-suppose a given set of conditions, and with this in view a description of a system applicable to the costing of coke with its several by-products is given.

Metallurgical coke is the result of the distillation of coal

which, being put into airtight ovens, heated, and the gases driven off, leaves a solid matter, composed of carbon, ash, sulphur, and phosphorus, which is known as coke.

The gases driven off are taken into coolers and condensed, and the primary by-products extracted from the volatile matter. These are tar, ammonia, benzol, and gas. After the gases are drawn from the ovens by the exhausters, the tar is condensed, which leaves the ammonia and benzol to be extracted in the saturators and scrubbers respectively at a proper temperature. The gas which is left is returned to the ovens for heating purposes, or sold through gas mains to consumers.

This brief description of coal distillation is given to show that a system of costing for a coking plant should be of such an elastic composition to meet any extensions which might be made to further distillation of the by-products, as such products as tar and benzol can be further subjected to distillation and valuable by-products recovered.

Raw Material—Coal. When the coal comes in from the various collieries, it is weighed, and particulars, weight, and name of colliery, together with particulars of coal consumed, dirt washed out, stocks of coal in trucks or bunkers, and daily quantity of coal received, are sent every morning to the Cost Department by the traffic manager.

The weigh cabin is situated so that all incoming and outgoing traffic will pass this point, allowing everything to be weighed and accounted for. On the traffic manager will rest the responsibility of always having a constant supply of empty wagons and a proper stock of coal in hand.

The coal, after being weighed, is teemed, washed, and put into storage bunkers, and when ready for use is conveyed to the crushers to be ground into a fine state before it is charged into the ovens.

Classification of Accounts. The system of process cost accounts for this industry will require an extensive and elastic system of account classification, each account to coincide with each process and by-product, so that all direct and indirect charges will be absorbed in a proper manner. The principle involved in the operation of a process costing system is largely that of account classification. Cost accounts relating to each department or process will be opened and all the expenditure charged to each process or department. The object, therefore, is to classify all expenditure by process and by incidence.

Direct charges, such as wages and materials, can be allocated by charging direct to the product concerned, leaving the indirect expenses to consist of as small a proportion as possible.

Wages, materials, and expenses can be allocated directly to the various by-products by giving a control letter or code to these products, but the indirect items should be given a control letter which in turn will be spread over the products using them, according to their use. Stores, wages, and materials which cannot be allocated against any definite control letter, will be dealt with on the same basis. Below is given a list of control letters and classification of accounts which will absorb all costs incurred in a coke and by-product plant of average size—

Control Symbol

- (a) Coal handling plant.
- (b) Coal carbonizing.
- (c) Coke manufacture.
- (d) By-products (general).
- (e) Tar manufacture.
- (f) Sulphate of ammonia.
- (g) Benzol.
- (h) Naphthalene.
- (i) Gas.
- (j) Tar distillation.
- (k) Oils (general).
- (l) Green oil and anthracene paste.
- (m) Creosote.
- (n) Pitch.
- (o) Boilers.
- (p) Locomotives.
- (q) Tar plant cleaning.
- (r) River pumps.
- (s) Repairs and Maintenance Department.
- (t) Plant Expense Account.
- (u) General Expense Account.

(a) COAL HANDLING PLANT. General labour directly connected with washery, drainage, bunkers, crushers, elevators, and crushed coal bunker, water pipe line from tank to washer-work on washery ponds, platelayers, working on washer roads, etc., also stores and machinery will be booked to this control letter.

(b) COAL CARBONIZING. All machinery, stores, and work, connected with the following: Chargers (including bunker

slides), cranes, rams, brickwork on ovens, all mains, valves, and pipe work in cellars as far as benzol scrubbers, change over gear, pug-mills, and stacks.

(c) COKE MANUFACTURE. To include all machinery, stores, and general labour directly connected with benches, conveyors, pipes, rails, pumps, etc., relating to quencher ; screens and pipe line from tank to ovens, also platelayers working on coke roads will book their time, etc., to this letter.

(d) BY-PRODUCTS (GENERAL). To include all ascension pipes, tar mains, and gas mains from ovens to tar sprays, connecting, but not including, tar sprays, saturators (in sulphate house), naphthalene coolers, and benzol scrubbers ; exhausters, all steam pipes connected with steaming out of the above. Main pipe line from boilers to by-product end, tar circulating pumps and pipe work connected with same, gas compressors, repairs to railway tanks, any work generally connected with pump house. Platelayers working on tar plant road to book under this letter. Any work connected with by-products, but not definitely connected with any one by-product, to be booked under this letter.

(e) TAR MANUFACTURE. All work and materials used in connection with tar sprays and connections from same to and including liquor and tar storage tanks (in well only), tar spray pumps and pipe work connected with same, and steam pipes connected with above.

(f) SULPHATE OF AMMONIA. Apparatus for emptying acid tanks, all steam pipes in sulphate house, and liquor tank, tower, and pipe line from tar plant to lime-stills. All plant, stores, and work connected with sulphate house, including acid storage, saturators, liquor pumps, lime-stills, air compressors, and all pipe work connected with above. Any general labour directly connected with above to be booked under this letter.

(g) BENZOL. All plant, stores, and work in regard to benzol house, wash oil coolers, wash oil pumps, and wash oil storage tanks ; benzol storage tanks, scrubbers, apparatus for filling benzol tanks, creosote pipe line from tar plant, water pipe line to wash oil coolers, all steam pipes connected with above.

(h) NAPHTHALENE. All plant, time, and materials used for surface coolers, naphthalene spray coolers, naphthalene storage houses, steam pipes connected with above, water pipe line to cooler, and pumps for same.

(i) GAS. To include all stores, work and plant, gas holder, meter, regulating valves, and gas main from scrubbers to gas holder.

(j) **TAR DISTILLATION.** All work and stores connected with tar storage tanks and pipe work to tar plant, washing tanks, settling tanks, feed tanks, feed pump heaters (but not including coils), stills (not including pitch cooler), gas pipe from exhaustor house, flues, etc.

(k) **OILS (GENERAL).** Still head pipes and coils in heaters, condensers, test boxes, and connections to and including storage tanks, steam pipes connected with above. Any work connected with oils, but not definitely connected with anthracene or creosote, to be booked under this letter.

(l) **GREEN OIL AND ANTHRACENE PASTE.** All stores and work connected with agitating tanks, settling tanks, wells, pumps, strainers, whizzers, anthracene paste storage house, green oil storage tank, and steam pipes connected with above.

(m) **CREOSOTE.** All work and stores on towers, settling pans, apparatus for filling barrels, creosote storage tanks, and steam pipes connected with above.

(n) **PITCH.** Pitch coolers, pipe lines, and connections from same to pitch beds, also time of platelayers working on permanent way to pitch beds.

(o) **BOILERS.** Brickwork, feed pumps, feed water heaters, boiler valves, and mountings, water pipe line to same.

(p) **LOCOMOTIVES.** All work and stores connected with locomotives and locomotive shed.

(q) **TAR PLANT CLEANING OUT.** All work and stores used in cleaning out of tar plant.

(r) **RIVER PUMP.** All machinery, stores or work in connection with river pumps, including pipes, lines, valves, etc., connecting and including tank

(s) **REPAIRS AND MAINTENANCE DEPARTMENT.** Stores or work such as cleaning offices, painters, carmen, stables and cartshed, cleaning men's cabins, etc., and which cannot be allotted to any of the other control letters, also any repairs to the fittings in joiners', electricians' and fitting shops, repairs to trucks, cleaning up yard, lighting of yard, repairs to offices, etc., and platelayers on main roads.

The total expenditure incurred by each of the departments making a definite product is easily ascertained by the use of the following classification of accounts and very little explanation will be needed in regard to accounts (a), (c), (e), (f), (g), (h), (i), (l), (m), (n) and (q). With regard to the remainder, and which relate to departments or work of a semi-direct nature, the expenditure in each case is allocated over the direct manufacturing accounts ((a) to (q) above) on

a percentage basis or other more convenient method. A suggested method of allocation is given against accounts (b), (d), (j), (k), (o), (p), (r), (s), (t), and (u), but in view of the variation in the design of coke oven plants, the method used in actual practice must be determined according to the special conditions of each plant.

COAL HANDLING PLANT (WASHERY)—

*Account
Symbol*

Coal.	(a) 1.
Direct labour (permanent).	2.
Labour (repairs, maintenance, etc.).	3.
Material and supplies.	4.
Energy and locomotives.	5.
Water (river pump).	6.
Depreciation (buildings and equipment).	7.
Plant expenses (office, stores, and laboratory, etc.).	8.
General expenses (insurances, rates, etc.).	9.

COAL CARBONIZING ACCOUNT—

*Account
Symbol*

Coal carbonized.	(b) 1.
Direct labour (permanent).	2.
Labour (repairs and maintenance).	3.
Material and supplies.	4.
Energy.	5.
Gas returned to ovens.	6.
Depreciation (machinery, equipment, and stacks).	7.
Plant expenses (offices, stores, laboratory, etc.).	8.
General expenses.	9.

(Note. This account is absorbed by Coke and By-products proportionately, according to yields.)

COKE MANUFACTURE—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(c) 1.
Direct labour (permanent).	2.
Labour (repairs and maintenance).	3.
Materials and supplies.	4.
Energy and locomotives.	5.
Water (river pump).	6.
Depreciation (machinery and equipment).	7.
Plant expenses (office, stores, laboratory, etc.).	8.
General expenses.	9.

BY-PRODUCTS (GENERAL)—

*Account
Symbol*

Direct labour (permanent).	(d) 1.
Labour (repairs and maintenance)	2.
Material and supplies.	3.
Energy.	4.
Steam.	5.
Depreciation (plant and machinery).	6.
Plant expenses (offices and stores).	7.
General expenses.	8.

(*Note.* This account is absorbed by the By-products, Tar, Benzol, Ammonia, Naphthalene, and Gas proportionately, according to yields.)

TAR MANUFACTURE—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(e) 1.
Proportionate part of By-products (General) Account.	2.
Labour (repairs and maintenance).	3.
Material and supplies.	4.
Steam.	5.
Depreciation (plant and machinery).	6.
Plant expenses (offices, stores, etc.).	7.
General expenses.	8

SULPHATE OF AMMONIA—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(f) 1.
Proportionate part of By-products (General) Account.	2.
Direct labour (permanent).	3.
Labour (repairs and maintenance).	4.
Materials and supplies.	5.
Energy and locomotives.	6.
Steam.	7.
Sulphuric acid.	8.
Lime (lime-stills).	9.
Depreciation (plant, machinery, and buildings).	10.
Plant expenses (offices, stores, laboratory, etc.).	11.
General expenses.	12.

BENZOL—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(g) 1.
Proportionate part of By-products (General) Account.	2.
Direct labour (permanent).	3.
Labour (repairs and maintenance).	4.
Materials and supplies.	5.
Energy and locomotives.	6.
Steam.	7.
Absorbent oil.	8.
Water (river pump).	9.
Depreciation (plant, machinery, and buildings).	10.
Plant expenses (offices, stores, laboratory, etc.).	11.
General expenses.	12.

NAPHTHALENE—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(h) 1.
Proportionate part of By-products (General) Account.	2.
Direct labour (permanent).	3.
Labour (repairs and maintenance).	4.
Materials and supplies.	5.
Water (river pump).	6.
Steam.	7.
Depreciation (plant and machinery).	8.
Plant expenses (offices, stores, laboratory, etc.).	9.
General expenses.	10.

GAS—

*Account
Symbol*

Proportionate part of Coal Carbonizing Account.	(i) 1.
Proportionate part of By-products (General) Account.	2.
Labour (repairs and maintenance).	3.
Materials and supplies.	4.
Depreciation (plant).	5.
Plant expenses (offices, stores, laboratory, etc.).	6.
General expenses.	7.

TAR DISTILLATION—

*Account
Symbol*

Tar distilled at cost price of tar manufacture.	(j) 1.
Direct labour (permanent).	2.

TAR DISTILLATION—*contd.*

	<i>Account Symbol</i>
Labour (repairs and maintenance).	(j) 3.
Proportionate cost of tar plant cleaning out (on per day basis).	4.
Materials and supplies	5.
Energy.	6.
Gas to tar plant.	7.
Steam.	8.
Depreciation (plant and machinery).	9.
Plant expenses (offices, stores, laboratory, etc.).	10.
General expenses.	11.

(*Note.* This account is absorbed by Oils (General) Account and Pitch Account in proportion to their yields.)

OILS (GENERAL)—

	<i>Account Symbol</i>
Proportionate part of tar distillation cost.	(k) 1.
Direct labour (permanent).	2.
Labour (maintenance and repairs).	3.
Materials and supplies.	4.
Steam.	5.
Depreciation (plant and machinery).	6.
Plant expenses (offices, stores, laboratory, etc.).	7.
General expenses.	8.

(*Note.* This account is absorbed by Green Oil and Anthracene Paste Account and Creosote Oil Account, according to yields.)

GREEN OIL AND ANTHRACENE PASTE—

	<i>Account Symbol</i>
Proportionate part of Oil (General) Account.	(l) 1.
Direct labour (permanent).	2.
Labour (maintenance and repairs).	3.
Materials and supplies.	4.
Energy and locomotives.	5.
Steam.	6.
Depreciation (plant and machinery).	7.
Plant expenses.	8.

CREOSOTE OIL—

	<i>Account Symbol</i>
Proportionate part of Oil (General) Account.	(m) 1.
Maintenance and repairs.	2.
Depreciation (plant and equipment).	3.

PITCH—

	<i>Account Symbol</i>
Proportionate part of tar distillation.	(n) 1.
Labour (pitch bed men).	2.
Labour (repairs and maintenance).	3.
Materials and supplies.	4.
Locomotives.	5.
Depreciation (pitch beds).	6.
Plant expenses (offices, stores, laboratory, etc.).	7.
General expenses.	8.

BOILERS—

	<i>Account Symbol</i>
Fuel.	(o) 1.
Water.	2.
Direct labour (permanent).	3.
Labour (repairs and maintenance).	4.
Materials and supplies.	5.
Depreciation (boilers, buildings, and stacks)	6.
Plant expenses (offices, stores, etc.).	7.
General expenses.	8.

(Note. This account may be absorbed by Benzol 25 per cent, Tar Distillation 30 per cent, By-products (General) $2\frac{1}{2}$ per cent, Tar Manufacture 5 per cent, Sulphate of Ammonia 20 per cent, Naphthalene $2\frac{1}{2}$ per cent, Oils (General) 5 per cent, and Green Oil and Anthracene Paste 10 per cent.)

LOCOMOTIVES AND MAIN PERMANENT WAYS—

	<i>Account Symbol</i>
Coal.	(p) 1.
Water.	2.
Direct labour (permanent).	3.
Labour (repairs and maintenance).	4.
Materials and supplies.	5.
Depreciation (locomotives and sheds).	6.
Depreciation (permanent way).	7.
Plant expenses (offices and stores).	8.
General expenses.	9.

(Note. This account may be absorbed by Coal Handling 40 per cent, Coke 30 per cent, Benzol 10 per cent, Sulphate of Ammonia 5 per cent, Green Oil 5 per cent, and Pitch 10 per cent.)

TAR PLANT CLEANING OUT—

*Account
Symbol*

Labour.	(q) 1.
Materials and supplies.	2.
Supervision.	3.

(Note. This account is gradually absorbed by Tar Distillation.)

RIVER PUMP—

*Account
Symbol*

Labour.	(r) 1.
Labour (repairs and maintenance).	2.
Materials and supplies.	3.
Depreciation (buildings, pumps, and pipe lines).	4.
Plant expenses (offices, stores, etc.).	5.
General expenses.	6.

(Note. This account is absorbed by Coal Handling 25 per cent, Coke 25 per cent, Naphthalene 30 per cent, and Benzol 20 per cent.)

REPAIRS AND MAINTENANCE DEPARTMENT—

*Account
Symbol*

Labour (general).	(s) 1
Material and supplies.	2.
Energy.	3.
Heating and lighting.	4.
Tools.	5.
Depreciation (buildings).	6.
Depreciation (plant and machinery).	7.
General expenses.	8.
Salaries and superintendence.	9.

(Note. Transferred to Plant Expense Account (t).)

PLANT EXPENSE ACCOUNT (OFFICES, STORES, AND LABORATORY)—

*Account
Symbol*

Wages and salaries (permanent).	(t) 1.
Miscellaneous supplies and expenses.	2.
Depreciation (buildings).	3.
Depreciation (furniture and fittings).	4.
General expenses.	5.
Repairs and Maintenance Department (transfer).	6.

(Note. This account is absorbed by Washery, Coke, and all By-products.)

GENERAL EXPENSE ACCOUNT (INSURANCE, RATES,
ETC.)—

	<i>Account Symbol</i>
Administrative salaries.	(u) 1.
Rents and rates.	2.
Insurance.	3.
Directors' fees and expenses.	4.
Travelling expenses.	5.
Printing and stationery.	6.
Postages and telephones.	7.
Advertising.	8.
Audit charges.	9.
Canteen expenses.	10.
Bad debts.	11.
Bank charges and interest, etc.	12.

(*Note* This account is absorbed by Washery, Coke, and all By-products.)

Timekeeping. As direct and indirect labour is employed, there are two methods of computing time, by shift and by hours. All shift work time should be kept by the foreman and checked weekly with clock cards, while datal time should be kept by a timekeeper and checked in the same way.

At the end of the week all clock cards and time books should be sent to the Wage Department for entry in the usual way, and an allocation in total of all datal workers' time, with the control letter covering the time spent should be sent to the cost office for costing purposes.

Time lost on shift work should be inquired into as often as possible, as lost time causes disorganization on a coking plant.

Payment of Wages. Wages are paid by the shift of eight hours for overmen and by the hour for datal men. A loose-leaf pay roll should be used, as this allows for the work to go on smoothly and no one is kept waiting until other work is finished. Wages totals should be checked in the usual manner, and wages should not be paid by anyone having made up the wage sheets.

It is customary to issue pay notes to the men employed in ovens. These contain the number of shifts worked, money due (less offtake), and other particulars customary to various districts. These notes can be written out after the wages sheets are finished, or they may be filled in at the same time as the wage sheets are being made up by the use of carbon paper.

MATERIAL CONSUMPTION ACCOUNT

[illegible]

ELECTRIC CURRENT
-----Units at-----per Unit = f -----

GAS TO TAR PLANT
 -----Cubic Feet at-----per 1,000 Cubic Feet = £-----

T. C.	Price.	f s d	T. C.	f s d
COALS CARBONIZED.				
Stock on _____ 19_____				
Drainage Bunkers				
Crushed Coal Bunkers				
Washery Settling Ponds				
Clean Coals put up (including Washery Coal)				
Stock on _____ 19_____				
Drainage Bunkers				
Crushed Coal Bunkers				
Washery Settling Ponds				
COALS CARBONIZED				

GAS TO OVENS

C. F. at ----- per 1,000 cubic ft. = £-----

Stores and Materials. Stores and materials used in connection with coke oven plants are of a very heavy nature, and a proper system of store handling is necessary. No stores should be issued without a proper stores requisition, and this should state clearly the purpose for which the material is required and the control letter given.

Records of stock should be kept on the card system, a duplicate of which should be kept in the cost office under the supervision of a responsible clerk, who will see that his records of stock on hand (stock record card) agree with the records (bin cards) of the storekeeper. Periodical checks should be taken by actually ascertaining the quantity on hand of any given article, and steps taken to ascertain the cause of any discrepancy. (See BIN INSPECTION.)

Consumable Stocks. To complete recovery of by-products large consumable stocks have to be carried. These stocks should be carefully checked every week to get the amount

Form No. 29.

..... COLLIERY COMPANY

GENERAL EXPENSE ACCOUNT

Dr.	£		Cr.	£
1. Administrative Salaries		By Transfers—		
2. Rents and Rates . . .		(a) Coal Handling . . .		
3. Insurance . . .		(b) Coal Carbonizing . . .		
4. Directors' Fees and Expenses . . .		(c) Coke Manufacture . . .		
5. Travelling Expenses . . .		(d) By-products, General		
6. Printing & Stationery		(e) Tar Manufacture . . .		
7. Postage & Telephones		(f) Sulphate of Ammonia		
8. Advertising . . .		(g) Benzol . . .		
9. Audit Charges . . .		(h) Naphthalene . . .		
10. Dining Room Expenses		(i) Gas . . .		
11. Bad Debts . . .		(j) Tar Distillation . . .		
12. Bank Charges and Interest . . .		(k) Oils, General . . .		
		(l) Green Oil and Anthracene Paste . . .		
		(n) Pitch . . .		
		(o) Boilers . . .		
		(p) Locomotives & Main Permanent Ways		
		(r) River Pump . . .		
		(s) Repairs & Maintenance Department		
		(t) Plant, Overhead A/c Unabsorbed Overhead . . .		
	£			£

used in production. Slackness in this matter will often cause more stocks to be consumed than necessary, thus increasing the cost of the by-products.

Production Record. A record of the daily production containing the production of coke, tar, sulphate, benzol, and gas for the previous day should be sent to the cost office. This can be arranged to give what other information is thought to be desired, as it forms the basis for statistical information.

Depreciation and other items of Establishment Expense. Depreciation on coke oven plants is a heavy item and must be provided for either by a reserve, or by an extensive maintenance equipment. As to what this reserve or equipment should amount to yearly can only be decided by previous experience, but nothing can be lost by keeping the plant in an efficient state of repair.

The monthly establishment expense should be allocated to a General Expense Account (Form No. 29), and the total amount of this monthly charge be debited to the Coke, By-product, and Auxiliary Accounts, according to a pre-arranged percentage or some other method of allocation.

Monthly Accounts and Costs. As soon as possible after the end of the month the costs for the preceding month should be commenced upon. All coal received during the month should be compared with the stocks on hand and consumption during the period. Dirt washed out should be ascertained, and as this is a loss, should be added to the price of coal. All expenses should be allocated over the manufacturing accounts, and all costs of whatever nature disposed of. When all charges have been accounted for the manufacturing accounts will show a difference in the debit or credit columns, which will, of course, be a profit or loss.

Monthly cost sheets can now be compiled which will contain all the information in the manufacturing accounts (only in more detail) together with selling expenses. The monthly cost sheet (Form No. 30) should be so designed to show up comparisons in cost between given periods, and should give totals for every distinct part when making up a total cost.

If monthly manufacturing accounts and monthly cost sheets are compiled as suggested, there should be no difficulty in reconciling the Cost or Manufacturing Account with the financial accounts, and every endeavour should be made to do so.

Statistics. Statistics are of much importance in a coke oven plant, and the productive results for the year or for any

MONTHLY COST SHEET FOR COKE, BREEZE, AND BALLAST

MONTH ENDING

19 . . .

. . . TONS MADE

	CURRENT MONTH.						THIS YEAR TO DATE.					
	Manu- facturing		Main- tenance		Total		Manu- facturing		Main- tenance		Total	
	Amount	Cost per ton	Amount	Cost per ton	Amount	Cost per ton	Amount	Cost per ton	Amount	Cost per ton	Amount	Cost per ton
COKE PRODUCTION COSTS.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Proportionate Part of C.C. A/c.												
Labour, Permanent, Direct												
Labour, Permanent, Indirect												
Labour, Maintenance, Direct												
Labour, Maintenance, Indirect												
Materials and Supplies												
Energy and Locomotives												
Water												
National Insurance												
Superintendence												
Plant Office Expenses												
Sundry Expenses												
Total Prime Costs												
PLANT EXPENSES.												
Wages, Indirect												
Salaries, Indirect												
Materials and Supplies, Indirect												
Heating and Lighting												
Tools												
General Insurance												
Employers' Liab. Insurance												
Depreciation, Buildings												
Depreciation, Plant & Machinery												
Reserves												
Miscellaneous Supplies & Expns.												
Total of Prime Cost and Plant Expenses												
GENERAL EXPENSE CHARGES.												
Administrative Salaries												
Rent, Rates, and Taxes												
Directors' Fees and Expenses												
Travelling Expenses												
Printing and Stationery												
Postage and Telephones												
Audit Charges												
Dining Room Expenses												
Depreciation, Furniture & Fittings												
Bad Debts												
Bank Charges and Interest												
Office Expenses												
Total of Prime Cost, Plant, and General Expenses												
SELLING EXPENSES.												
Selling Office Exps. and Salaries												
Rent and Other Office Expenses												
Advertising												
Commissions												
Sundries												
Total of Prime Cost, Plant, General, and Selling Expenses for Coke												

other given period should be shown. In compiling statistics clearness must be aimed at, so that an immediate grasp of the points brought out can be obtained, and the necessary action taken by those concerned. (See also PROCESS COSTING.)

CARRIAGE. The expenditure incurred both in regard to carriage "outwards" and "inwards" will require to be analysed accordingly, as the former when confined to carriage on goods sold will be a charge to selling expense, and the latter, if restricted to carriage on purchases of materials used for manufacturing purposes, is a charge to "Material Expense" or "Factory Expense" Account.

It will, therefore, be seen that carriage charges of every description will require the most careful analysis, as the practice of charging all the expense incurred in connection with the Sales Department, for instance, to the one account will not serve any useful purpose, in view of the fact that the sundry carriage charges incurred by the Sales Department will include the expense of goods returned by customers for various reasons in addition to the carriage outwards on goods sold.

Likewise the carriage inwards should not all be grouped into the one account, as the expense which relates to the carriage on raw materials required for manufacturing purposes should be segregated from any expense incurred on the return of faulty or rejected materials and for sundry other reasons.

The correct treatment of carriage expenses, the term "carriage" being used as referring to the charges made by railway and other transport companies and to exclude the expenses of any Transport Department, etc., run by the company, will require that a proper system of expense classification be used in order that the sub-accounts will clearly show the incidence of this charge.

The treatment of carriage inwards when solely relating to charges incurred on raw materials for manufacturing purposes, is either a charge to factory expense or, in those cases where a separate Material Handling Expense Account is used, it should be charged to this account.

In those cases where a merchanting as well as manufacturing business is carried on, it will be necessary to segregate the carriage inwards, as the expense of the former is a charge to selling expenses and the latter to the factory.

In regard to carriage outwards, the charges incurred upon

goods dispatched to customers will be allocated to selling expenses, and carriage on rejected or faulty materials returned to the supplier should be charged to a separate account, and included in with the factory expense or charged direct to Profit and Loss Account.

Carriage Inwards. The items charged to this account generally refer to carriage charges made by railway and other transport companies in connection with the transit of materials and goods to the works, and may therefore include carriage on raw materials and merchantable goods, as well as the carriage on goods returned by customers as faulty, etc. In such cases the account will require analysing, as the carriage expense relating to each of the above items will require different treatment as follows—

(a) *Carriage inwards on materials required for manufacturing purposes.*

The carriage expense of this class of materials may be dealt with by four different methods according to circumstances—

1. Allocated to factory expenses and recovered in costs with the factory expense rate.
2. Allocated to a Material Handling Expense Account and recovered separately in costs as a percentage on the value of materials consumed on each job, order or process
3. Added to the purchase price of the materials.
4. Treated as a direct charge.

With the majority of industries the use of both methods 1 and 4 will give the best results, as heavy carriage charges on special materials can easily be charged direct to the job, order or process for which they are required, all the sundry items of carriage being included among the factory expenses. With the very large concerns, however, it may be necessary to use both methods 2 and 4, but it should always be borne in mind that with method 2 an equitable distribution of the material handling expense is only possible when the respective kinds of materials consumed are more or less uniform as regards "value" and "weight" or "bulk"; for instance, if the material handling expense is distributed as a percentage on the value of materials used on an order or process, the amount added to an order that requires a small quantity of expensive materials, such as brass, copper, gun-metal, or high speed steel, etc., may be as great or even more than the amount added to an order that has consumed a cheaper and heavier class of material, such as castings, etc. In the case of the former the actual "handling" expense may be very

much less than the latter on account of the difference in weight and the bulkiness of most castings.

With regard to method 3, this can only be adopted in exceptional cases, and although it may be possible to analyse the carriage expense to the respective consignments, the work entailed may be so great as to render it impracticable. Furthermore, it will invariably be found impossible to apply the carriage charges to all the stores items, as the numerous sundry supplies may be too small so far as the quantity or weight of each item is concerned.

Method 4 is rarely adopted alone, being generally used in addition to one or more of the remaining methods, and whenever this is possible it should be adopted for all items that can be dealt with as a direct charge.

(b) *Carriage inwards on merchantable goods.*

Carriage on merchantable goods, i.e. goods on which no work is done but which are resold in the same condition as received, may be dealt with as follows—

5. Allocated to selling and distribution expenses and recovered in costs with the selling expense rate.

6. Added to the purchase price of the goods.

7. Treated as a direct charge.

The choice of any of methods 5 to 7 will depend upon the nature and size of a business; for instance, where the merchanting business is not large and goods are only purchased against a customer's order, the carriage thereon can be treated as a direct charge, but in those cases where a big factoring trade is done, the special circumstances applicable to the business must be considered and the method or combination of methods selected accordingly.

With very large concerns, however, it may be desirable to deal with the expense of handling and storing, etc., of all saleable products by allocating the expense to a Sales Department Material Handling Expense Account in a similar manner to that sometimes done with the storage and handling of materials used by the factory. In such a case the carriage is then charged to this account and/or treated as a direct charge whenever possible.

(c) *Carriage inwards on faulty, etc., goods returned by customers.*

The charges on this item are dealt with according to the reason why the goods have been returned; for instance, the carriage on goods which are rejected owing to defective workmanship is a charge against the factory, but if the fault

is due to defective materials, it is a charge to a special "Service Order," which is finally closed out to Cost of Sales Account or Profit and Loss Account. With small concerns, however, such analysis of this item of carriage may not be necessary and the total is allocated to the one account.

Carriage Outwards. The amount of this account will usually refer to charges made by railway and other transport companies in connection with the transit, etc., of goods to a customer's address, and in all such cases the total of the account forms part of establishment expenses, and is allocated to selling expenses.

With large concerns the account may include carriage charges on faulty materials that have been returned to the suppliers for credit or replacement, and the item will then require to be analysed, but in the majority of instances such expense accounts will be properly classified, and any carriage incurred on faulty materials, etc., will be allocated direct to its correct account.

The inclusion of carriage outwards among the factory expenses is not recommended, inasmuch as the charge does not accrue until the goods have been sold. Furthermore, carriage outwards is more correctly a charge to selling expenses.

CASH DISCOUNTS. (See DISCOUNTS ALLOWED and DISCOUNTS RECEIVED.)

CATALOGUES—COST OF. The expense incurred in the printing, etc., of catalogues may sometimes be charged in the accounts to advertising expenses or analysed as a separate item. This expense should be dealt with upon the same principle as advertising expenses, and any specially large expense incurred in connection with the marketing of new products should be regarded as a direct charge to the cost of those products or the amount spread over a definite period.

The expense of general advertising and literature, etc., is best dealt with by being allocated direct to selling expenses.

CHAIRMAN'S FEES. The fees paid to the chairman of the board of directors form part of the establishment expenses of a business and are allocated to administrative expense.

CHARGEABLE EXPENSE. (See DIRECT EXPENSE.)

CHARGEABLE TIME. (See DIRECT LABOUR.)

CLASS COST METHOD OF COST FINDING. The class cost method of cost finding is a term that is often used to

denote the job costing method when applied to the costing of goods by classes instead of the unit or piece. In place of the "cost" being separately compiled for each article or piece of machinery, the cost will cover a group of orders of the same class of product. Whilst the job covers the "class" instead of the "piece" we still have the job costing method, but with a different unit of output to that usually associated with the more general form of job costing.

The use of the class cost method is, therefore, confined to those industries where the various kinds of articles made are capable of classification into groups, owing to their similarity both as regards materials and the process of manufacture.

The products of a foundry when limited to small or "light" castings are often conveniently grouped into classes, according to weight and each class costed separately. For instance, castings of 1 lb. and under may be classified into one group; 1 to 3 lb. into group two, and 3 to 5 lb. into group three, and so on. The cost of each class is ascertained and the total weight produced divided into the cost of each group or class to give a cost per pound. This rate is then used for pricing the individual lots which comprise each class. By such means all castings which come within the limits of each group are costed as one lot instead of preparing separate costs for the individual castings. (See also **COST FINDING—METHODS OF**, and **JOB COSTING METHOD OF COST FINDING**.)

CLASSIFICATION OF ACCOUNTS. The term used to denote the arrangement of the accounts of a Company in an orderly manner. Accounts which have a close relationship to each other are grouped together under suitable headings. Those accounts which have only a remote relationship are separated and grouped accordingly.

A method of classifying accounts will usually become necessary with large concerns due to the volume of transactions which have to be dealt with in the financial and cost accounting routine. The number of accounts in use will depend upon the number and variety of detailed statements which must be prepared.

Many advantages arise from a system of account classification, some of which may be summarized as follows—

1. Some means of grouping accounts upon a logical basis must be employed. Otherwise, a considerable amount of time can be lost in re-arranging and re-analysing when preparing statements at the end of a costing or accounting period. It is far easier to prepare statements when the accounts which are

related to each other are grouped together than when they are scattered throughout the ledgers with no regard to their connection.

2. A definite control in the handling of the accounts is provided as new accounts can be added and placed in their proper position in the ledgers without disturbing the remainder.

3. It provides an instruction and guide to the office and factory staff, thereby reducing errors in allocating entries.

4. The use of symbols or account numbers is an economy in clerical effort.

To employ a system of account classification, it is necessary to make use of symbols for the purpose of indexing the accounts which at the same time will enable one to refer to individual accounts by symbols rather than by their full name.

Reference to "General Shop Expense—Cleaning and Sweeping of Department Y Controlled by the Manufacturing Expense Control Account" is a clumsy term to use when "Account 5060" would convey the same meaning. Symbols of different kinds are used. Some consist of letters only and others of figures, but symbols which are a combination of letters and figures are to be preferred, as they are more flexible and enable the codes to be expanded or contracted without the necessity of a complete re-arrangement.

The examples of account classification which follow are not intended to be complete in all respects as sufficient is only given to indicate in a general manner the principles involved.

The subject of account classification enters into many phases of cost accountancy and requires different treatment in almost every instance. In the case of materials, the method of classification will be determined by the nature of the industry carried on and the system of costing employed. Expenses may also require different treatment to materials even in the same plant.

In a large number of instances, the classification of accounts is unfortunately restricted to a small part of the routine and may only be applied to the classification of materials or expenses. In a plant using a system of By-product Costing, one will frequently find that the classification has been restricted to the By-product Cost Accounts, and in other cases where, say, the Job Costing method is used the expense accounts or the system of Service Orders may be the only directions where the accounts have been classified.

If the full benefit is to be derived from any method of account classification, the system must be applied to the whole scheme of Financial and Cost Accounts.

A brief explanation of the principle of account classification when applied to specific parts of costing systems will be found under the headings of Service Orders, By-product Costing, Materials—Classification of, Expenses—Classification of, etc.

Classification of Balance Sheet Accounts. The final form in which a Balance Sheet is prepared will usually be a condensation of a detailed Balance Sheet. The detailed Balance Sheet should, therefore, be arranged in such a manner that the final statement can be prepared simply as a condensation of the detailed statements and without re-grouping or re-analysing any of the items. The accounts which go to make up a Balance Sheet can be more easily classified than Income or Expense Accounts as the grouping of assets or liabilities does not present any difficulty.

Classification of Income Accounts. The classification of Income Accounts will usually be arranged according to the natural groups into which the income will fall, the major items being suitably analysed to give all the information required and the incidental or sundry items grouped separately. This group of accounts will usually consist of an analysis of sales and may only be a further breakdown of the total sales shown in the Trading or Profit and Loss Account, but in those cases where the more modern form of accounts are used, there will be a Cost of Sales Account in place of the older form of Trading Account and the classification of Sales will then become an extension to the classification of the Cost Accounts. The size of the concern and the class of trade carried on will determine the method that will be used. With the large concern income will consist of other items besides sales and this must obviously be taken into consideration. Income from Investments, Royalties and Licences, etc., may form part of the revenue and in such cases the classification of Income Accounts will be arranged accordingly. The two examples which follow will convey the general principles of account classification much better than giving a lengthy description in words. The one example covers a small or medium size concern and the other is arranged for a much larger concern.

Classification of Cost Accounts. Expense Accounts will form the biggest task with most concerns due to the large number and the nature of accounts which are involved. Under this heading are included the purchase of materials for manufacturing, labour, plant operating expenses, cost of sales, stocks on hand, etc., as well as the ordinary or establishment expense items.

No definite procedure can be given under this heading as

different methods must be adopted to suit the requirements of each concern. The method of Cost Finding in use will, to a large extent, determine the form in which these accounts will be classified. For instance, in the carbonization of coal (or coke) industry, the cost accounts in themselves will, or should, produce the classification of accounts and an example is given under the heading of By-produce Costing. Most systems of Process Costing will also establish a form of account classification and the examples which follow deal with the subject as applied to manufacturing concerns using the job method of Cost Finding.

The classification of Cost Accounts should only deal with the operating and prime trading or expense accounts. In cases where a concern operates several plants, the classification must be arranged in such a manner that each plant can develop its own classification. The chief requirement in these cases is that the accounts be classified in accordance with the standard scheme as drawn up by the Head Office. Standardization of operations and transactions between different plants of the same concern may be possible in many cases, and standard operating statements and Balance Sheets, etc., can then be designed and the system of account classification built up accordingly, but in those cases where this is not possible, standard operating statements, etc., should only be prepared up to the point where standardization is possible. The non-standard items will then be classified by the individual plants in accordance with the principles laid down by the Head Office.

The following example refers to a small or medium size concern and the principle of coding the accounts is to allot letters to distinguish each group of asset and liability accounts and numbers to the individual accounts in each group.

<i>Liabilities</i>	<i>Assets</i>
A. Current Liabilities.	E. Current Assets.
B. Fixed Liabilities.	F. Stocks on hand
C. Reserves.	G. Fixed and Investment.
D. Capital.	H. Deferred Assets.

Revenue and Expense

- J. Sales less Deductions.
- K. Cost of Sales.
- L. Material and Manufacturing Variations.
- M. Factory Expenses.
- N. Commercial Administrative.
- P. Selling Expense.
- R. Other Income and Charges

CLASSIFICATION OF ACCOUNTS

1. *Current Liabilities*

- 10. Bills Payable
- 11. Sundry Creditors
 - 1100 Raw Materials
 - 1101 Parts and Supplies
 - 1102 Carriage and Shipping
 - 1103 Miscellaneous
- 12. Accrued Liabilities
 - 1200 Accrued Wages
 - 1201 " Salaries
 - 1202 " Commission
 - 1210 " Plant Expenses
 - 1211 " Administrative Expense
 - 1220 " Rates and Taxes
 - 1250 " Miscellaneous
 - 1260 " Interest
 - on Bills Payable
 - " Debentures
- 13. Accounts due to Subsidiary Companies
 - 1300 Bills Payable to Subsidiary Companies
 - 1320 Current Accounts with Subsidiary Companies
 - 1330 Branch Office Current Accounts with Subsidiary Companies
 - 1350 Plant Current Accounts

2 *Long Term Liabilities*

- 20. Debenture Redemption
- 21. Mortgage Account
- 22. Etc.

3. *Reserves*

- 30. Stock Obsolescence
- 31. Design "
- 32. Plant "
- 33. Employees' Pensions
- 34. Etc.

4. *Capital*

- 40. First Debentures
- 41. Second Debentures
- 42. Preferred Shares
- 43. Ordinary Shares

5. *Surplus*

- 50. Profit and Loss Account
- 51. " " " Appropriation Account
- 52. Surplus

6. *Current Assets*

- 60. Cash on hand and at Banks
- 61. Bills Receivable
- 62. Sundry Debtors
 - 6201 Trade Accounts
 - 6202 Other Accounts

- 6250 Reserve against Sundry Debtors
 - 6251 Reserve for Bad and Doubtful Debts
 - 6252 " " Discounts and Allowances
 - 6253 " " Exchange Losses on Foreign Accounts
- Etc.
- 63. Accounts due from Subsidiary Companies
 - 6301 Bills Receivable from Subsidiary Companies
 - 6302 Branch Office Accounts—Subsidiary Companies
 - 6303 Plant Accounts—Subsidiary Companies
- 64. Stocks on hand
 - 6401 Plant Inventories
 - 6402 Raw Materials
 - 6403 Parts and Supplies
 - 6404 Work-in-Progress
 - 6405 Finished Goods
 - 6410 Materials in Transit
 - 6415 Goods on Consignment
 - 6420 " on Sale or Return
 - 6450 Miscellaneous Inventories
 - 6451 Stationery and Office Supplies
 - 6452 Advertising Literature, etc
 - 6453 Welfare Department Supplies
 - 6454 Dining Room
 - 6455 Packing Materials
 - 6456 Laboratory
- Etc.
- 65. Prepaid Expenses
 - 6500 Insurance
 - 6501 Rates and Taxes
 - 6502 Etc.
- 66. Sundry Current Assets

7. *Investments in Subsidiary Companies*

- 7000 A Company
- 7001 B "
- 7002 C "

8. *Plant, Machinery and Buildings, Etc.*

- 8000 Land
- 8020 Buildings
- 8030 Machinery
- 8040 Plant
- 8045 Tools
- 8050 Delivery Equipment
- 8051 Steam Wagons
- 8052 Motor Trucks
- 8060 Furniture, Fixtures and Fittings, Office
- 8061 " " " " Works
- 8062 " " " " Branches
- 8070 Patents
- 8071 Trade-marks
- 8080 Patterns
- 8080 Drawings

9. *Reserves for Depreciation*

9000	Depreciation—Buildings
9010	„ Machinery
9020	„ Plant
9025	„ Tools
9030	„ Delivery Equipment
9031	„ Steam Wagons
9032	„ Motor Trucks
9040	„ Furniture, Fixtures and Fittings Office
9041	„ Furniture, Fixtures and Fittings Works
9042	„ Furniture, Fixtures and Fittings Branches
9050	„ Patents
9051	„ Trade-marks
9060	„ Patterns
9061	„ Drawings

10. *Sundry Deferred Charges*

1010
1020

A. *Raw Material and Supplies Cost Accounts*

- A.00 Opening and Closing—Stocks on Hand
 - 01. Raw Materials
 - 02. Parts and Supplies
- A.10 Transfers in and out Departments
 - 11. Raw Materials
 - 12. Parts and Supplies
- A.20 Purchases
 - 21. Raw Materials
 - 22. Parts and Supplies
- A 30 Purchases from Subsidiary Companies
 - 31. Raw Materials
 - 32. Parts and Supplies
- A 40 Material Handling Expense

B. *Factory Expense Cost Accounts*

- B.00 Labour
 - 01. Direct
 - 02. Indirect
 - Etc.
- B.10 Repairs and Maintenance
- B.12 Rates and Taxes
- B.13 Welfare Expenses
- B 14 Fire Insurance
- B.15 Works Administrative Salaries
- B.16 „ Salaries
- B.17 „ Operating Expenses
- B.18 Power
- B.19 Electric Light
- B.21 Depreciation
- B.32 Etc

C. *Sales*

C.00 Sales

01. Home

02. Export

(The object of account classification is more accounting than statistical, and no attempt should be made to analyse sales by products or class of customers, etc. Such statistical information will be obtained independently and the sub-coding in any classification of accounts should be kept to a minimum.)

C.10 Sales to Subsidiary Companies

C.11 „ on Consignments

C.20 Transfers to Branches

C.21 Goods Returned

D. *Cost of Sales Account*

D.00 Opening and Closing entries of Finished Goods

D.01 Goods purchased for resale

D.02 „ „ from Subsidiary Companies

D 10 Cost of goods manufactured

(The cost of goods made should be the totals of sections A and B.)

D 20 Carriage Out

D 30 Packing

D.40 Finished Stores Expense

E. *Selling and Administrative Expense*

E.00 Salaries

E.01 Advertising

E 02 „ Literature

E.03 Commissions

E 10 Sundry Sales Expenses

E 20 „ Administrative Expenses

E.30 Insurance

E.35 Rates and Taxes

E.40 Travelling Expenses

E 50 Telephones and Telegrams

E 51 Stationery

F. *Non-operating Income and Expense*

F.00 Profit on Foreign Exchange

F.01 Loss „ „

F.02 Miscellaneous Interest Income

F.03 „ „ Expense

F 10 Interest on Bills Payable

F.11 „ „ Bank Overdrafts

F 12 „ „ Debentures—First

F.13 „ „ —Second

F 20 Taxes on non-operating properties

F.30 Rents Received

The above example has, of necessity, been abbreviated, but sufficient is given to illustrate the general principles that must be followed when compiling account classification. A great

deal will depend upon the form in which the statements are constructed and the use made of them by the management. In some cases, a cost of sales account may not be favoured due to the general habit of producing Profit and Loss Accounts or Trading Accounts under the older methods of accounting, but a short reflection on this subject will soon show that a cost of sales account is far more useful. If all the accounts under sections A, B, C, D, E, and F are arranged in statement form, the many advantages will be apparent. The accounts of section A and B should be so arranged that the totals of each will provide the cost of goods made for sale and this figure is either transferred to section D or the statement arranged in such a manner that the totals of each section are shown in columns and a net result arrived at by adding or subtracting the figures where necessary.

The production of Balance Sheets and other financial and cost statements are greatly simplified when all the accounts have been correctly classified, especially where a company may own several subsidiaries and in the case of mergers or amalgamations.

CLASSIFICATION OF COST. To employ any method of Cost Accounting, it is necessary that expenditure of all kinds be analysed according to use. This analysis or classification of costs is accomplished in several ways, depending upon the type and size of the business and the nature of the products manufactured or the service rendered.

Cost Accounting provides the means by which the functions of manufacturing, selling, and administration are co-ordinated and controlled. The analysis of expenditures must, therefore, be firstly considered upon the basis of function or activity.

The three main functions of most manufacturing businesses are—

1. Manufacturing.
2. Selling and Distribution.
3. Administration.

The classification of costs in this manner is important for two reasons. Firstly, it enables the three main divisions of a business to be segregated and the cost of operating each division ascertained both in detail and in total. The Manufacturing and Profit and Loss Statements, as prepared at the end of the usual financial periods and which form part of the General Accounting system, will usually segregate all the revenue and expenditure under these three headings to show

how profitable or otherwise these sections of the business have been. This division, therefore, provides the basis upon which one will usually set up a method of control between the General Accounting and the Cost Accounting.

The second reason for this classification is the responsibility for the management of each function, that is manufacturing, selling and general administration of the business—excepting in the case of the very small plant, no one individual should be responsible for all three activities. With all well-organized concerns, responsibility for manufacturing is invariably that of the Plant Manager, who should not be accountable for selling or the general administration of the business; likewise, the Sales Manager should only be responsible for the function of selling, with the Managing Director or General Manager controlling the general administration of the business.

Selling and Administrative Costs should not be included in the Inventory Valuation of articles manufactured. The determination of this Valuation is based solely on “processed cost,” or cost to deliver a job complete on the floor of the plant or to the Finished Stores, and here is presented an interesting point of distinction between “Manufacturing Cost” on the one hand, and “Selling and Administrative Cost” on the other hand. All articles manufactured must bear their share of manufactured cost, whether sold or otherwise, whereas only that portion of plant production placed through the distributive channels bears any portion of “Selling and Administrative Cost.”

Factory Cost or cost to produce will comprise all items of expenditure *incurred* in the manufacture of any commodity, i.e.—

The cost of Labour.

The cost of Materials consumed.

Factory Expense, such as—

Electricity for lighting and power.

Depreciation of Machinery and Buildings.

Salaries of plant clerks, etc.

Stationery and office supplies, etc.

Selling and Distribution Expense includes all the expenditure incurred in the sale and distribution of a firm's products. Selling expense embraces such items as—

Salaries of the Sales Manager and his staff.

Salaries of Branch Office Manager and staffs.

Discounts allowed.

Advertising and Catalogues.
Commissions to Agents or Salesmen.
Travelling Expenses of Salesmen.
Stationery and office supplies of Sales Departments.
Postage, etc.

Administration Expense will include those items of expenditure which are incurred in the General and Financial Administration of the business such as—

Salaries of Directors, General Manager, Secretary, Comptroller.
Cost of operating their respective departments.
Legal Expenses.
Bank Charges, etc.

With very large concerns, it is sometimes the practice to separate all the expenses incurred in regard to Finances and deal with these as a fourth group.

Elements of Cost. Every disbursement made or expenditure incurred to provide the material, labour, and facilities for manufacturing up to the point of completion of an article or process, must be comprised in the true cost of manufacturing. The technical conception of cost practically rules out the possibility of a "cost" being comprised of one element alone. In all cases a "cost" is the sum of three groups of components or elements, viz., the purchase price of materials, the cost of the hire of labour, and the value of other disbursements made or expenditure incurred in achieving the desired product or result. The elements of cost are, therefore, classified into three main groups and are known as—

1. Labour.
2. Materials.
3. Expenses.

Direct and Indirect Costs. The elements of cost are subdivided according to whether they are Direct or Indirect. The labour hired may be utilized in two ways: it may be employed in performing work "directly" upon a saleable article or product, or it may be usefully employed in such work as sweeping the shop floor, general labouring, repairing the plant and machinery, attending to the issue of materials from stores and carrying them to the work benches or in supervising all the workers in a department.

In the case of the former, the labour used in performing work directly upon a saleable article can be measured and

correctly allocated to the article, order, or process, and such labour is classified as "direct" labour, but in regard to the latter it is not possible to charge this labour to any specific article, process or order on the basis of the actual work done towards its completion, although without such labour as this it is probable that the direct labour could not have been applied with equal efficiency. Such labour is, therefore, classified as "indirect" labour. Indirect labour is apportioned to the individual costs according to some logical method, whereas direct labour forms a direct charge to the article or process, etc.

The Direct Labour in most manufacturing concerns is generally subdivided according to the different operations or trades of the workers, and examples of Direct Labour in a general engineering shop would be—

- Milling.
- Drilling.
- Planing.
- Grinding.
- Turning.
- Screw Cutting.
- Etc.

In the manufacture of shoe polish, the subdivision may be—

- Stamping—Lids and Bodies.
- Printing—Lids.
- Stoving Lids.
- Lipping and Beading Lids and Bodies.
- Making Liquid Paste.
- Filling.
- Etc.

With regard to Indirect Labour the subdivision of this item of expenditure would comprise such services as—

- Superintendence.
- Shop Foremen or Supervisors.
- Factory Clerks.
- General Labourers.
- Sweepers and Cleaners.
- Inspection and Viewing.
- Oiling and Cleaning Machines.
- Handling Materials (when not a direct charge to material costs), etc.

In the case of materials, there is an exact parallel. Certain materials may be worked upon for the specific purpose of changing the form or shape or combining with other materials in order to produce a saleable product. Such materials are known as "direct" materials, as the manner in which they are used is such that they can be correctly measured and charged direct to the article, process, or order.

There are, however, certain other materials which cannot be so easily measured and charged direct to the article, order or process, but which are necessary if the workmen are to complete their tasks. Such materials may include oil, waste, emery paper, small perishable tools, solder, chalk for polishing, belting and sundry items used for the maintenance of the plant and buildings, etc., and because they cannot be charged direct to each article or order, they are classified as "indirect" materials and apportioned in costs according to some logical method.

The treatment of Direct Materials is not so simple as Direct Labour, because it is not always practicable to charge these direct to an article, order, or process. For instance in the garment industry there will be classified as Direct Materials such items as Materials (or cloth), and Linings, etc., as these can be conveniently measured and charged to each order or garment, but in the case of cottons, braid, pins, chalk and buttons, etc., it will not be possible or practical to measure the exact quantity used for each garment or order. From a technical point of view these materials are Direct Materials, but it would not be economical to ascertain just how much was used for each garment or order. Such materials are usually dealt with as Indirect Materials. Another instance where an item may technically be a direct material cost but from a practical point of view cannot be directly chargeable to an article or order is in the Engineering Industry. Such materials as sheet brass, sheet copper, sheet iron, bar brass, bar steel, castings, etc., are easily measured and charged direct to the order, but in the case of paint or lacquer when used to paint the finished article it may cost more than the item was worth to charge it direct to the finished product. Such items are, therefore, dealt with as Indirect Materials. Examples such as the above can be found in almost all industries.

The expenses of a business are also subdivided into two groups: firstly, there are the expenses that have been specially incurred for specific orders and can, therefore, be charged direct to the specific article, operation or process and,

secondly, the expenses which have been incurred in the general running of a business, and which can only be dealt with as a general charge over the whole business. The former are known as "direct" expenses and the latter as "indirect" expenses.

Direct expenses may comprise such items as the cost of any assistance or facilities used for a special order or process: for instance, a portable crane or special machinery may be hired for a particular job, special travelling and other expenses incurred or heavy charges for carriage on materials or parts, special draughting, etc., and all other items which are capable of being charged direct to the order.

Indirect expenses will comprise postages, stationery, telephones, taxes, salaries of office departments and departmental managers, depreciation, insurance premiums, and all cash disbursements and book charges which cannot be directly chargeable to any one process or order.

The subdivisions of the three Elements of Cost are grouped under two main headings, namely—

(a) Direct Labour.	(b) Indirect Labour.
Direct Materials.	Indirect Materials.
Direct Expenses.	Indirect Expenses.

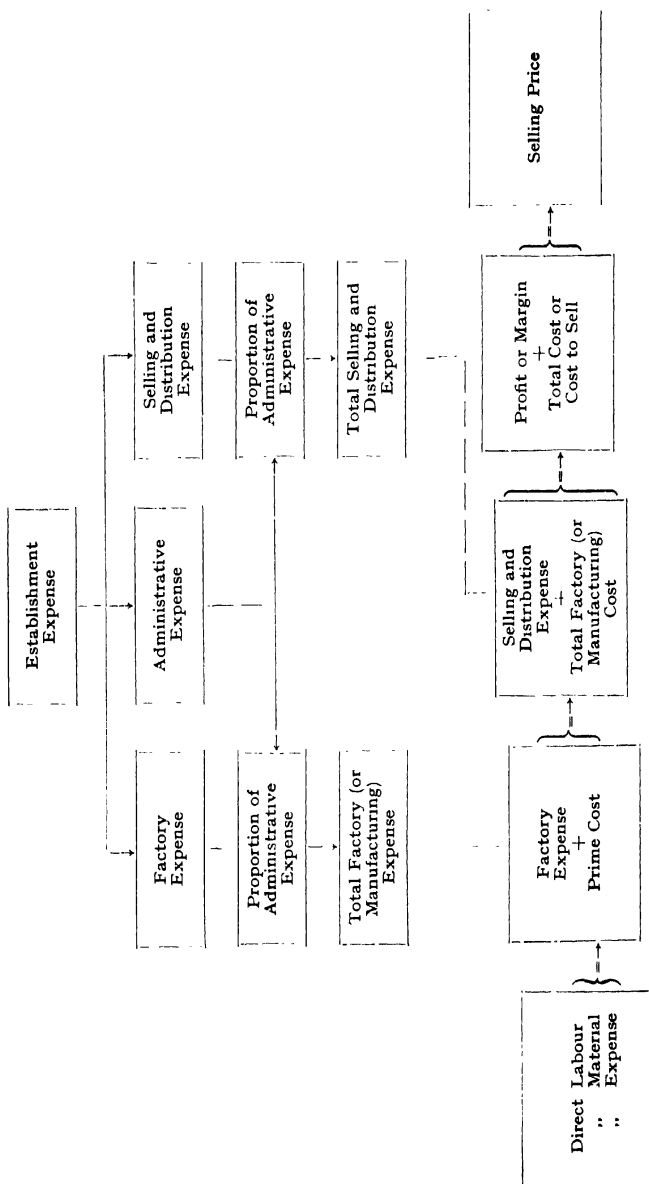
The sum total of group (a) gives the Total Direct Cost or Prime Cost and group (b) will comprise the Establishment Expense of a business.

From the foregoing classification there has been constructed the chart, page 84, to show how the various Elements of Cost are built up to form a Total Cost and Selling price and how the Establishment Expense is distributed to the manufacturing, selling and administrative divisions of a business and finally absorbed in the cost to make and sell.

The correct classification of costs is the first important step in the process of costing and a thorough understanding of this subject is very important. The principle of classification is simple to apply if understood. The further analysis of expenditure according to the Elements of Costs and to Direct and Indirect is the logical sequence in which the subject follows.

The accuracy of any costing system depends to a very great extent upon the manner in which the Direct and Indirect items are dealt with. The more that items can be charged direct to an account the smaller the number of indirect charges, and the effect of this will be apparent when it is realized that indirect items must be distributed over the products or

CHART SHOWING HOW THE ESTABLISHMENT EXPENSE OF A BUSINESS IS ANALYSED INTO THE THREE MAIN DIVISIONS AND THE DISTRIBUTION OF THE ADMINISTRATIVE EXPENSE TO THE FACTORY AND SELLING DIVISIONS



processes in several ways, none of which are as accurate as the direct charge method.

The application of Direct items presents no particular problem, because the cost is incurred specifically for a job or department. Indirect items, however, require to be handled with greater care, and the method of their allocation is important, particularly so because in some cases the amount of Indirect Cost is greater than the Direct Cost. Carelessness in applying Indirect Cost is responsible for the failure of many costing systems and has resulted in condemnation of the science, when in reality the method of application was at fault. It should be fully realized that the careful and accurate handling of Direct Costs may be rendered absolutely useless due to lack of sufficient thought and care in the distribution of Indirect Costs. (See also CLASSIFICATION OF ACCOUNTS.)

CLASSIFICATION OF DEPARTMENTS. (See DEPARTMENTS—CLASSIFICATION OF.)

CLASSIFICATION OF EXPENSES. (See EXPENSES—CLASSIFICATION OF.)

CLASSIFICATION OF MATERIALS. (See MATERIALS—CLASSIFICATION OF.)

CLOCK CARD. Cards used for the mechanical recording of the time of arrival and departure of workers or the starting and finishing of each task. The rulings of these cards differ with the type of time recorder used and the purpose for which the records are required. Those cards which are used for recording the times of arrival and departure of workers are known as "gate cards," and those on which are recorded the starting and finishing time of each task or job are known as "job cards" (See also GATE CARD and JOB CARD.)

COLLECTION OF EXPENSES. A term used when referring to the work of collecting and summarizing all the establishment expenses of a business, so that they can be allocated or apportioned to the Factory and Sales Departments, etc., for the purpose of computing the necessary rates and recovering them in costs, or to check the rates previously fixed upon estimates or in connection with systems of budgetary control or standard costing.

The collection of expenses and their transfer from the financial accounts to the cost accounts are the first phase in the general treatment of establishment expenses, and the actual method used will materially depend upon the system in use and the general conditions prevailing in each business. For instance, when a system of cost control accounts is in use

Form No. 31.

EXPENSE ALLOCATION STATEMENT

FOR MONTH ENDING 30TH JUNE, 19 ...

A/c. No	Description.	Total.	Allocation.		
			Adminis- trative.	Selling.	Factory.
	<i>Variable Expenses.</i>	£	£	£	£
A. 301	Advertising . . .	100			
B. 258	Branch Office Ex- penses	300			
B. 259	Bank Charges . . .	400			
C. 101	Commissions on Sales	500			
C. 102	Carriage (Purchases)	600			
C. 103	Carriage (Sales) . .	700			
G. 59	Gas	800			
I. 45	Insurance : National	900			
L. 92	Legal Expenses . .	1,000			
L. 93	Lighting (Electricity)	2,000			
P. 79	Printing and Station- ery	200			
P. 80	Power (Electricity) .	3,000			
S. 30	Salaries	4,500 <i>etc.</i>			
		£15,000			
	<i>Constant Expenses.</i>	£	£	£	£
	Depreciation—				
	Plant and Machy	6,000			
	Buildings . . .	5,000			
	Heating Plant .	4,000			
	Insurance : Fire, etc	3,000			
	Rates and Taxes .	2,000			
	Salaries	3,000 <i>etc.</i>			
		£23,000			

Form No. 32.

EXPENSE ALLOCATION STATEMENT

SUMMARY OF SERVICE ORDERS CHARGEABLE TO EXPENSE ACCOUNTS

FOR MONTH ENDING 30TH JUNE, 19 ...

A/c. No.	Description.	Total.	Allocation.		
			Adminis- trative.	Selling.	Factory.
		£	£	£	£
	Repairs and Main- tenance—				
S.O. 110	Plant	1,000			
S.O. 120	Machinery . . .	1,100			
S.O. 130	Buildings . . .	1,200			
S.O. 140	Office Fixtures and Fittings	1,300			
S.O. 150	Works Fixtures and Fittings	1,400			
S.O. 160	Heating Plant . .	1,500			
S.O. 170	Patterns	1,600			
		£9,100			
		£	£	£	£
	Indirect Labour—				
S.O. 210	Supervision . . .	100			
S.O. 220	Shop Clerks . . .	200			
S.O. 230	Cleaning & Sweeping	300			
S.O. 240	Material Handling .	400			
S.O. 250	General Labouring .	500			
S.O. 260	Viewing, etc. . .	600			
	<i>etc.</i>				
		£2,100			
		£	£	£	£
S.O. 310	Storekeeping . . .	700			
S.O. 420	General Purposes .	800			
	<i>etc.</i>				
		£1,500			

(Note. When a system of control accounts is in use the entries journalizing the above figures, so that the amount of expenses can be reconciled with the financial accounts, will be found under "Cost Control Accounts" (Expense Section).)

Form No. 33.

SUMMARY OF EXPENSE ALLOCATION STATEMENTS

FOR MONTH ENDING 30TH JUNE, 19... .

A/c. No.	Description.	Total.	Allocation.		
			Adminis- trative.	Selling.	Factory.
	Variable Expenses .	£ 15,000	£	£	£
	Constant Expenses .	23,000			
	Service Orders—				
	Repairs and				
	Machinery . .	9,100			
	Indirect Labour .	2,100			
	Storekeeping, etc. .	1,500			
		£50,700			

the collection of expenses will usually be done at the end of each month or quarter, and the necessary Journal entries prepared at the same time to transfer the items to the Expense Control Account in the Cost Ledgers.

The collection of expenses may be conveniently considered under two headings: First, there will be those items of expenditure which fluctuate according to volume of production, such as weekly salaries, postages, stationery, indirect labour, indirect materials, power and lighting charges when obtained from outside sources, repairs and maintenance, works clerical assistance, and sundry expenses of varying kinds, etc. ; secondly, there are the constant expenses which will comprise such items as rent, rates, taxes, depreciation, directors' fees, fire insurance premiums, etc.

The collection of the items which comprise the variable expenses is a comparatively easy matter, as the totals for the month or other period are obtained from the financial accounts, also "Standing" or "Service" orders, and entered upon an Expense Allocation Statement, of which the specimens (Forms 31, 32 and 33), show the work completed up to this stage.

With regard to constant expenses, all these items may not appear in the books of account as a liability from month to month, but only at varying periods; for instance, taxes, insurance, directors' fees and depreciation, etc., will only be paid or journalized, perhaps once each year, and it is therefore necessary that such items be separately listed in order that a monthly (or quarterly) quota may be fixed for inclusion in the Expense Allocation Statement.

The statement of constant expenses will, therefore, consist of expenses that are represented by actual cash payments and amounts for those items which may not appear in the accounts as a liability each month.

As these amounts must be anticipated, it is usual that Suspense Accounts be opened for each item or group of items, in order that the amount included each month (or other period) in the Expense Allocation Statement can be compared and adjusted when necessary with the actual amounts that will ultimately appear in the financial accounts. In such cases the Suspense Account at the end of each year appears thus—

Form No. 34.

SUSPENSE ACCOUNT—DEPRECIATION

<i>Dr.</i>				<i>Cr.</i>			
19..		J.E.	£ s. d.	19 .		J.E.	£ s. d.
Dec.	To Depreciation w/o for year	130	59,500 - -	Jan.	By 1/12th Depreciation to be w/o for year ending 19..	1	5,000 - -
	" Expense Control A/c	140	500 - -	Feb.	" "	20	5,000 - -
				Mar.	" "	30	5,000 - -
				Apr.	" "	40	5,000 - -
				May	" "	50	5,000 - -
				June	" "	60	5,000 - -
				July	" "	70	5,000 - -
				Aug.	" "	80	5,000 - -
				Sept.	" "	90	5,000 - -
				Oct.	" "	100	5,000 - -
				Nov.	" "	110	5,000 - -
				Dec.	" "	120	5,000 - -
			£ 60,000 - -			£	60,000 - -

(*Note.* If Cost Control Accounts are used the entries each month would be—

Dr. Expense Control Account

Cr. Suspense Account (Depreciation)

and that the final adjusting entry (i.e. December) would be the reverse to above.)

The employment of Suspense Accounts for each group of

items similar to the above enables a very close check to be kept upon all those items that will only appear in the accounts when the usual Balance Sheet, etc., adjustments are made at the end of a financial period. With large concerns, however, there will usually be many such items, and to facilitate the clerical work involved, the use of a form of analysed Ledger ruling similar to the following will be an advantage—

Form No. 35.

SUSPENSE ACCOUNT—EXPENSES

Total Annual Charge.			Item.	January.	February.	March.	April, etc.
£	s.	d.		£	£	£	£
			Depreciation	5,000	5,000	5,000	5,000
			Directors' Fees.	1,000	1,000	1,000	1,000
			Rates and Taxes etc.	700	700	700	700

With the above ruling only one Journal entry will be necessary each month, as the whole of the items are grouped into one account. (See also ESTABLISHMENT EXPENSE.)

COMMISSIONS ON OUTPUT. The amount paid by way of commissions on output to the works manager and other factory officials is a charge to the factory expenses. In those cases where special rates of commission or bonus are paid upon certain articles, the commission is then more correctly a direct charge to the contract or works order, but if the article is being continuously manufactured, it is usual to charge the commission to a separate account and then apportion the amount over the whole of the output for the period.

The commissions on output must be kept quite separate from any commission or bonus on profits. Commission on output is a charge to production, whereas a bonus on profits paid to any factory employee is an allocation of profits.

COMMISSIONS ON SALES. The amount of commissions paid to the sales manager, travellers or salesmen, etc., may be dealt with by either of the following methods—

1. As a charge to selling expenses.
2. As a direct charge to the product or order.

1. The charging of commissions to selling expenses, so that they may be recovered as a general charge over the whole sales, is the method that is generally used when the sales

comprise a variety of articles, and where the commissions paid cannot be conveniently analysed or dealt with by other methods. If the commission is paid as a general rate over the total value of orders secured and completed, and is irrespective of the type or value of the article, this method will give very good results. If the concern is departmentalized, or the products it manufactures can be clearly separated, the commission may be analysed in a similar manner and the expense charged to each department or separate product.

2. In those cases where the orders or contracts secured are large, and where the rates of commission vary with the products or sales price, the method of charging such commissions to each product or order should be used wherever possible.

COMPARATIVE COST CARD. A record arranged for comparative purposes of the detailed factory cost of each article, component or part. In those businesses where the saleable products are finally assembled from a number of standard components withdrawn from the finished part stores, a record of the cost of each component or part will be necessary. This record serves the purpose of pricing such parts when issued from the stores, and also enables comparisons to be made of the factory or prime cost of identical parts manufactured on the different production orders.

In some instances it may be necessary to show an analysis of the labour cost by operations or processes, so that any variations from the standard cost of each operation can be brought to the notice of the department concerned. The cause of the abnormal cost is noted in the " remarks " column for future guidance.

In an engineering works, for instance, the record may show the analysis of labour under the headings of turning, milling, drilling, gear cutting, fitting, etc., and by comparing the labour cost of each operation of the particular component, any deviation from a standard performance is easily shown.

When components or parts are drawn from stock for final assembly, the figures necessary for pricing the stores requisitions will be obtained from this record by the Costing Department.

The actual method of writing up the comparative cost record cards will naturally depend upon the type of article or component which is to be recorded, and the number of operations performed thereon. The illustration given on page 92 is only arranged to record the total of each element of cost

Form No. 37.

COMPARATIVE COST CARD

Name of Article or Component

Part No.

Drg No

WORKS ORDER NUMBER.

DATE STARTED

DATE FINISHED

QUANTITY MADE

OPERATIONS.

Labour Cost. Per----

Factory Expense. Per----

Labour Cost. Per----

Factory Expense. Per----

Labour Cost. Per----

Factory Expense. Per----

1.

2.

3

4.

5.

6.

7.

8.

9.

10.

TOTAL FACTORY EXPENSE

TOTAL LABOUR

TOTAL MATERIALS

FACTORY COST

on the respective orders. When details are required respecting each operation, the ruling can sometimes be better arranged by placing on the left-hand side of the card, in column form, the names of the various operations, and dividing the remainder of the card into columns for entering the cost of each order. For instance, assuming that seven or eight columns are ruled in the manner suggested, the headings of each column should contain space for the works order number, date commenced and finished, quantity made, as illustrated on page 93.

The comparative cost record card serves two very useful purposes. Firstly, it provides the basis of comparing the detailed cost of each quantity of identical parts made at different periods, and, secondly, it gives the figures for pricing components used on assembly orders. (See also **COMPARATIVE COST STATEMENTS.**)

COMPARATIVE COST STATEMENTS. The preparation of comparative cost statements forms a most important part of a cost accountant's duties and a system of Cost Finding and Cost Control produces many statistics which are of great importance to the General Management of a business. By the production of those statements, a cost accountant is able to interpret the results of a concern's activities, indicate trends, etc., and so convey this information to the management in a manner that is easily and quickly understood.

Comparative statements must be prepared in such a manner that the information they are intended to give shall immediately be obvious upon glancing at the form. They must be in a predigested form and should not require a long and close study before one can discover what the figures represent or what information they are intended to convey.

Comparative Cost Statements differ greatly from Cost Summaries, examples of which are given under that heading. The purpose of Cost Summaries broadly speaking is twofold. Firstly, they show in a concise and easily read form the results in terms of cost of the manufacturing activities in the plant and of the share of management and selling expenses that are correctly chargeable to each order, process or product. Secondly, they form a basis for the preparation of Comparative Cost Statements. Cost summaries may be used whenever it is desired to compare the Factory cost and "cost to Sell," etc., with the selling price of the article or order, but if these summaries are studied closely, it will be observed that a great deal more information can be obtained from them. For instance, the total cost can be analysed to show the extent to

which labour has entered into the cost of the product as compared with materials or expenses. Labour can also be further analysed to show the class or type of help used in the manufacture of certain products as against others.

Materials can also be analysed to show the extent to which cheap and expensive materials have entered into the different products.

With regard to Factory and Selling Expenses, etc., either the proportion of these to the complete cost or the fluctuation of expenses absorbed by the cost of similar articles over a period can be shown.

Fluctuations in the cost of labour, materials, expenses and output, etc., over long periods form an important subject for analysis and comparison and the results of this analysis is conveyed to the management by means of Comparative Cost Statements.

Labour statistics form one of the most general subjects in regard to analysis. These statements may take the form of analysing the various types of labour employed in the plant and comparing these figures with past periods. It is not sufficient, however, to give the total wages paid by, say, trades or departments for the current period and then to show the figures for the same period in the previous year. Wages will sometimes fluctuate by substantial amounts, but one must take into consideration the fluctuation of output and of the number of persons employed, etc. Otherwise, the results may be misleading.

The example of a Comparative Cost Statement, Form 38, will serve to illustrate the type of information that is sometimes given in regard to the number of employees and the wages paid compared with similar figures for the previous year. The statement shows the average number of employees, not the total number. The use of the average in this instance is preferable to totals, as it shows more clearly the variation in the payroll. If totals are given instead of averages, it becomes necessary to study the statement very closely in order to determine the net fluctuations in labour for the period in question. By using averages in this particular record, it is immediately shown whether any change in the basic rate of pay has occurred, i.e. if employees are being paid more per week as compared with the previous year. Averages should be used with a great deal of discretion as very misleading results or trends can be given by their wrong use.

Comparative Cost Statements covering materials will differ

Form No. 38.

COMPARATIVE STATEMENT OF AVERAGE NUMBER EMPLOYEES
AND WAGES PAID

WEEK ENDING 5TH JANUARY, 1936 AND 1937

DEPARTMENT	1936			1937		
	Average Number Employed	Total Payroll	Average Weekly Wage	Average Number Employed	Total Payroll	Average Weekly Wage
		£ s. d.	s.		£ s. d.	s.
<i>Producing Departments</i>						
Turning	47	135 7 2	57 60	49	140 10 2	57 35
Milling	32	87 16 10	54 90	37	102 9 10	55 40
Drilling	27	57 12 11	42 70	28	60 6 10	43 10
Planing	19	35 14 5	37 60	18	32 15 2	36 40
Coil Winding	39	49 14 6	25 50	41	52 1 5	25 40
Armature Winding . .	26	38 4 5	29 40	24	34 13 7	28 90
Painting	14	15 1 -	21 50	12	12 9 -	20 75
Assembly	21	34 1 5	32 45	20	33 2 -	33 10
Test	17	39 15 7	46 80	19	42 9 6	47 20
Etc.						
Total	242	493 8 3	40 77	248	510 17 6	41 36
<i>Service Departments</i>						
Power	7	17 8 2	49 75	7	17 18 5	51 20
Repair	11	20 12 6	37 50	10	18 12 7	37 25
Stores	5	10 6 -	41 20	5	10 10 7	42 10
Receiving	3	5 3 10	34 60	3	5 3 -	34 30
Tool Room	10	25 6 -	50 60	11	27 14 5	50 40
" Stores	3	6 6 7	42 20	4	8 7 2	41 80
Heating	4	6 10 10	32 70	4	6 12 5	33 10
Welfare	7	10 19 10	31 40	7	10 15 2	30 75
Etc.						
Total	50	102 13 9	41 07	51	105 13 9	41 44
Grand Total	292	596 2 -	40 83	299	616 11 3	41 38

according to the size of the business and the class of trade carried on. The two examples of statements, Forms Nos. 39 and 40, one covering materials delivered to a Foundry and the other of the output, are given to indicate the general principles underlying such statements. Similar statements may also be prepared covering the purchase of raw materials or of materials used in production, materials spoiled, scrap or defective work. The kind of information it is intended to convey will determine the manner in which the figures will be assembled.

Comparative Statements of factory output analysed to give operations and processes, etc., as well as the different articles made, will usually form another series of figures of great benefit to the plant manager or production engineer. Statements of this nature will usually give statistics which are essentially "technical" in so far as production is concerned,

Form No 3.

STATEMENT OF METAL DELIVERED TO FOUNDRY
FOR YEAR ENDING 31ST DECEMBER, 19..

METAL	Jan	Feb	March	Apr	May	June	July	Aug	Sept.	Oct.	Nov	Dec.	Total
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Turnings	7,560	6,291	6,845	6,537	7,321	8,519	7,912	7,415	5,678	7,684	7,807	6,952	86,301
Zinc	2,740	2,825	3,113	3,820	2,984	2,680	3,251	3,602	3,110	2,850	2,489	2,122	35,357
Tin	1,390	1,725	1,816	1,872	1,795	1,542	1,497	1,627	1,334	1,186	1,268	1,107	18,359
Copper	9,240	10,321	8,640	8,997	9,101	9,075	9,118	7,099	8,154	8,656	9,341	9,201	106,943
Washings	3,620	4,160	4,067	3,985	3,988	3,205	4,185	3,904	3,991	4,205	4,417	4,821	48,528
Bad Castings	4,110	3,353	3,948	4,079	5,001	3,720	3,901	4,108	3,668	4,201	4,195	4,089	48,373
Scrap	1,072	2,037	2,119	1,975	1,984	2,541	1,607	2,105	1,303	1,542	1,298	4,161	23,764
Phosphor Tin	201	16	172	—	301	102	71	86	102	91	83	74	1,302
Copper Scrap	—	—	—	37	102	117	—	—	61	—	191	42	550
" Wire	76	42	17	—	—	—	—	—	—	102	61	—	298
Antimony	16	21	14	—	—	—	—	—	—	—	42	—	93
Nickel	11	16	21	14	—	—	51	—	—	—	—	26	139
Scrap Sheets	—	—	—	102	17	—	—	—	101	—	—	—	220
Filings	802	721	402	628	906	702	411	827	—	108	407	598	6,512
Total	31,038	31,549	30,974	32,026	33,470	32,203	32,004	30,773	27,502	30,805	31,602	33,193	376,939

Form No. 40.

STATEMENT OF FINISHED CASTINGS DELIVERED FROM FOUNDRY
FOR THE YEAR ENDING 31st DECEMBER, 19..

MIXTURE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
No. 2	lb. 4,712	lb. 4,276	lb. 5,071	lb. 5,456	lb. 5,072	lb. 4,854	lb. 4,587	lb. 4,502	lb. 4,741	lb. 5,128	lb. 5,281	lb. 5,107	lb. 58,897
No. 5	6,070	7,142	6,842	6,418	7,204	6,815	6,940	7,411	6,259	6,921	6,022	5,107	79,153
No. 6	4,900	3,275	3,778	3,915	4,174	3,684	3,574	4,078	4,911	3,127	3,680	3,545	46,941
No. 8	2,075	2,112	2,201	1,894	1,881	2,103	1,955	1,882	2,008	1,579	1,449	1,928	23,067
No. 9	5,044	9,017	7,650	7,841	8,116	7,840	7,687	7,801	7,340	7,209	7,184	3,663	89,372
No. 11	5,271	4,845	4,108	5,067	3,551	1,403	1,061	1,233	961	307	628	4,512	52,947
No. 12	371	—	—	—	1,772	1,280	1,495	—	—	—	146	—	5,064
	31,443	30,689	29,650	30,591	31,770	27,979	27,579	27,007	26,220	24,271	24,390	23,862	335,431

RECONCILIATION

<i>Deliveries of Raw Material</i>	<i>Deliveries of Finished Castings</i>
Inventory—31st December, 19..	Lb. Inventory—31st December, 19
Deliveries during year	Deliveries of Finished Castings for year 19..
	Inventory—31st December, 19
Less Inventory, 31st December, 19..	Gross output for year
	Shrinkage (= 5.54%)
	<u>363,837</u>

whereas similar statements, prepared for the information of the general manager or commercial executives, will usually give sterling values of articles in place of the total and average units of operations or processes, etc.

It is important that the object in preparing such statements must always be kept in mind. Statements made up of figures that do not convey their story are not only useless, but if great care is not exercised in their presentation very serious results may follow by the wrong impression being given to executives. (See also COMPARATIVE COST CARD.)

COMPRESSED AIR PLANT—DEPRECIATION OF. (See DEPRECIATION, also PLANT—DEPRECIATION OF.)

COMPRESSED AIR PLANT—REPAIRS AND MAINTENANCE. The maintenance and repair of the compressed air plant are ascertained separately by means of "Service Orders," and the item charged to the "Power Expense Account—Compressed Air."

The segregation of this item is necessary in order to arrive at the total cost of the "Compressed Air" Service, which is finally charged to Machine Tools or Tool Expense Account. (See also POWER EXPENSE)

COMPUTATION AND RECOVERY OF EXPENSES. The work of selecting the basis for recovering expenses in costs and the calculation of an expense rate for use in connection therewith.

Upon completion of the work entailed in the allocation of expenses there must, firstly, be decided the basis upon which these expenses are to be recovered in costs before the actual expense rate can be calculated.

There are a number of methods of recovering expenses in costs. No one method can be regarded as suitable under all conditions or even applicable to any one particular class of industry, as the nature of the product or goods and the conditions under which they are made will not be the only deciding factors. The size of the factory and the volume of production must to an equal extent also enter into any consideration of this subject.

The various methods principally used for recovering expenses are as follows—

- | | |
|-----------------------------------|-------------------------------|
| (1). Percentage on direct labour. | (4). Direct labour hour rate. |
| (2). Percentage on prime cost. | (5). Machine rate. |
| (3). Departmental rate. | |

The methods 1 to 5 above principally relate to the recovery of factory expenses, but when the total establishment expenses

of a business are not separated into factory and selling, etc., one general expense rate will then be used.

(A detailed consideration of each of the above methods will be found under their respective headings.)

When selling expenses are dealt with separately, they are recovered in costs by one of the following methods—

(a) As a rate per article dispatched and invoiced to customers.

(b) As a percentage on the works cost of goods dispatched to customers.

(c) As a percentage on the sales value of goods dispatched to customers.

A full explanation of each of these methods will be found under "Selling Expenses,"

CONSTANT EXPENSES. Items of establishment expenses which do not vary directly with the volume of output or trade, such as rent, rates, taxes, fire insurance, depreciation of buildings, directors' fees, etc. (See also **ESTABLISHMENT EXPENSE**.)

CONSTRUCTION COSTING. (See **TERMINAL COSTING**; also **COST FINDING—METHODS OF**.)

CONSUMABLE STORES. (See **INDIRECT MATERIALS** and **EXPENSE MATERIALS**.)

CONTINUOUS INVENTORY. (See **STOCK RECORD CARD**.)

CONTRACT COSTING. (See **TERMINAL COSTING**; also **COST FINDING—METHODS OF**.)

CONTRACT SYSTEM OF WAGE PAYMENT. This is in use principally in shipyards and really amounts to a method of sub-contracting. A foreman, or some man who has the confidence of a number of his fellows, agrees to do certain work for a fixed remuneration, the firm finding materials and facilities, and the man finding the labour, with whom he makes his own terms for remuneration.

It is obvious that there is grave danger of sweating by this method, and it is not looked upon as a desirable method.

Another defect is that the employer really has no control over the labour, although the men are working on his premises.

Machine tools also suffer considerably under any system of contracting.

CONTROL ACCOUNTS. (See **COST CONTROL ACCOUNTS**.)

CONVERSION COST. The cost of converting raw materials into prepared materials or finished products, exclusive of the cost of raw materials.

CONVEYOR SYSTEM—DEPRECIATION OF. (See **DEPRECIATION, PLANT—DEPRECIATION OF**, and **SERVICE ORDERS**.)

CONVEYOR SYSTEM—REPAIRS AND MAINTENANCE OF. The expenditure in connection with the repair and maintenance of the conveyor system is a charge to the Conveyor Expense Account, and is not directly apportioned over the departments using this service. The object here is to ascertain the total cost of running the conveyor system, as each department is charged with its proportion of the total cost, instead of each item being apportioned separately.

CO-OPERATIVE PRODUCTION—METHOD OF REMUNERATING LABOUR. (See PRIESTMAN METHOD—WAGE INCENTIVE)

CO-PARTNERSHIP—PROFIT-SHARING. Neither of these is a method of remunerating labour, strictly defined, but it is convenient to deal with them under this heading. The payment of wages is directly connected with production and, broadly speaking, may be said to be the reward of production. Schemes of co-partnership or profit-sharing are in recognition of a totally different principle, which is, that the success of any undertaking does not rest solely either on the management or the operatives, but on the harmonious relationship between the two. With a very few outstanding examples most of these schemes have proved abortive in the long run, and the reasons are not far to seek. The operative is not paid on the basis of individual output ; no distinction is made between the efficient and the inefficient ; profit is affected by factors outside the worker's control, whose action and reaction rather tend to discourage him ; the reward is too distant for the average worker ; the fact that while workers are ready to share profits they are not so ready to share losses.

Briefly, the essence of these schemes is that a share of the profits of the undertaking is paid to the workers in addition to their ordinary wages under a formal agreement, not as a right, but as a voluntary gift, tenable at the pleasure of the employer. The method of arriving at the fund to be distributed varies greatly, a common method being to allow a fixed percentage of the profit made above the average for a term of years past. This is a subject in itself, and reference should be made to some standard work for complete details.

COST. Costing terminology has been so loosely applied in the past that considerable difficulty often exists, both in practice and at meetings, when matters relative to costing are discussed. The word "cost" has a different meaning according to the manner in which it is used. From a technical point of view, for instance, it may be used when referring to

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the cost of manufacturing only or the cost of selling and distribution of goods, or to indicate the total cost of manufacturing, selling, and distribution.

Owing, therefore, to the very wide interpretation that can be placed upon this word, it should never be employed unless qualified in some particular way. By using the term "total cost" or "factory cost" there is clearly indicated the nature of the item under consideration.

The non-technical conception of the word "cost" varies with the circumstances, but in general, "cost" to the average man or woman is what he or she actually pays out of pocket to obtain the desired article. But a woman going up to London to buy a hat at sale price does not, as a rule, add the railway fare and other sundries to the price she paid to the shopkeeper when displaying her bargain to a friend, yet it is quite clear that these must be included if the true cost to her of the article is to be considered. Too often "cost" has been held to be the same thing as the sum of the immediate disbursements which were made to obtain or make the desired article, all other outgoings being considered as charges against profits.

From the technical point of view every disbursement made or expenditure incurred to provide the material, labour, or facilities for manufacturing up to the point of the completion of the article must be comprised in the true cost of production.

Two conclusions are, therefore, arrived at in regard to cost—

(a) That a cost is final and terminates at a specific point or stage or time.

(b) That a cost consists of actual outgoings or ascertained charges. Cost is not a sum of hypothetical charges, which may or may not arise, and which may or may not vary from the forecast.

It will now appear obvious that the word "cost" should never be used without some qualifying word or phrase to describe its application; for instance, the purchase of sheet brass for a metal working factory may be said to "cost" money. But this is a purchase for stock, purely a financial transaction, and although it has "cost" money, this money expended does not represent a "cost" to the business or an element in the "cost of production." It may be resold either in the course of the merchanting activities of the business or to realize the cash locked up for the purpose of capital expenditure. It is more accurate to talk of the "purchase price" of the sheet brass, and when handed over to the factory, to charge it to an order or process, when the value

at which the transfer is made may be correctly looked upon as an element of the cost of that order or process.

The technical conception of cost practically rules out the possibility of a cost being comprised of one element alone as in practically all cases a "cost" is the sum of three groups of components, viz., the purchase or transfer price of material, the cost of the hire of labour, and the value of other disbursements made or expenditure incurred in achieving the desired product or result.

The components of cost are classified into three groups and are known as—

- (1) Direct labour,
- (2) Direct materials,
- (3) Establishment expenses.

These elements are again grouped into factory costs and selling and distribution costs.

COST ACCOUNTANT—SALARY OF. The amount of salary paid to the cost accountant is an item of establishment expense and may be allocated direct to administrative expense or apportioned over the factory, selling, and administrative sections of the business, according to the extent it is estimated each benefits from the functions of this official. In some instances the Cost Department may be regarded as a part of the factory organization and the expense allocated accordingly, but such treatment of this item is incorrect.

COST—CLASSIFICATION OF. (See CLASSIFICATION OF COST.)

COST CONTROL ACCOUNTS. Accounts which form the medium of controlling all the expenditure chargeable to costs and which will also automatically provide the means of reconciling all expenditure with the financial accounts.

The results obtained from any costing system should be reconciled with the total expenditure as shown by the financial accounts, and for this purpose it is desirable that a proper system of cost control accounts be instituted so as to enable frequent and automatic reconciliation to be made.

Most businesses will require that the control be accomplished in two ways. Firstly, we have the control of expenditure in detail, and secondly, the control in total. The control of costs in detail must accommodate the cost of the individual article, order, or process, analysed according to the elements of cost, i.e. labour, materials and expenses, also the cost of selling and distribution and the cost of administration. The control of

costs in total must provide for the reconciliation of the detailed costs with the total expenditure as shown in the General Accounting records, i.e. the General Ledger.

Control and reconciliation should be frequent and the system arranged in such a manner that this frequent check is provided automatically and without the necessity of extracting special and separate statements.

The principles of control are simple as will be seen from the chart facing this page. The expenditure is firstly grouped and summarized according to incidence, i.e. labour, materials and expenses. The expenses that would appear in a Profit and Loss Account have been summarized and inserted on the top right-hand corner of the chart, and in the lower portion there is shown how the detailed costs are collected and then summarized and the results compared in total with the Cost of Sales Account.

Reconciliation is effected by summarizing the values of materials issued from stock, as by this means we are in a position to establish a balance between purchases of materials and the issues from stores, and also to ascertain the amount of stocks on hand: likewise by summarizing all the workmen's time or job cards we can balance these against their wages, and by summarizing the wages by departments we can balance these against the pay roll. By summarizing all the expenses charged to costs, we can compare the amount of establishment expenses recovered in costs with that actually incurred.

A system of cost control operated on this basis will enable one to account in detail for every penny expended inside the plant for labour (wages), materials (purchases), and expenses (other disbursements), and to balance stocks and total cost of production with the total of wages, purchases, and other General Ledger Accounts.

Principles of Cost Control. The principle upon which the control accounts are operated is as follows—

The financial control of materials is facilitated if the various items are subdivided into suitable headings, such as—

(a) Control of standard raw materials (i.e. those which comprise the output of the works or factory).

(b) Control of completely manufactured goods bought outside and resold in the same condition as purchased.

(c) Control of goods manufactured in the works or factory and which are ready for resale.

With regard to (a) and (b) the accounting transactions of these items in the financial books will have been dealt with,

The amounts as shown on the pay roll summaries are then journalized in the Cost Department—

Dr. Work in Progress Account (with Direct Wages)

Dr. Factory Expense Account (with Indirect Wages)

Cr. Wages Control Account (with the Total
Direct and Indirect)

The effect of the above entries is, firstly, to transfer from the Wages Account in the financial books the total amount spent for the week (or other period) ; and, secondly, to charge (a) work in progress with the amount of direct wages spent on production, and (b) Factory Expense Account with the amount of indirect wages which has to be ultimately recovered as an indirect charge on the factory's output.

It will be seen that these two items must now be dealt with separately so far as "control" is concerned, as the credits to Factory Expense Account (and other expense accounts) will represent the amount of works expenses absorbed by the respective jobs or orders or work in progress and will, therefore, include other indirect expense items.

Continuing with direct wages, a similar procedure is followed as described for materials, the Work in Progress Account being credited with the value of direct labour expended on each job or process as and when completed, as follows—

Dr. Finished Stock Control Account.

Cr. Work in Progress Account.

The above entry will only be made as and when each job or process is completed and will include, in addition to the amount of direct wages now under consideration, the cost of direct materials (already dealt with) and also the correct proportion of works expenses.

The routine for control of wages assists control of cash expenditure just the same as materials control. If every penny spent on wages is to be accounted for, it follows that it becomes a matter of extreme importance, and that there must be a thorough system of allocating each man's time; firstly, according to the nature of the work done, that is to say, work on production, repairs or indirect labour, and, secondly, such time must be further analysed on (1) work for specific items of production, (2) repairs in specific departments, and (3) different classes of indirect labour.

With regard to "indirect labour" the analysis provided by the pay roll will not meet all requirements, and in such cases where a more elaborate analysis is required, as with

large works, the segregation of indirect labour is effected by means of "standing orders" or "service orders."

Expense Control. The expenses of a business are divisible into two main groups, that is—

1. Expenses that have been specially incurred for specific orders and can, therefore, be charged direct to the specific job, operation, or process; and

2. Those expenses which have been incurred in running the business, which can only be apportioned according to some logical method.

Number 1 will not form part of the expenses now under consideration, as these items will be charged direct to their respective jobs or processes, and consequently will require slightly different treatment so far as "control" is concerned.

With regard to 2, the items which comprise this group are known as establishment expenses, and these will again be further analysed into—

1. Factory expenses.
2. Selling expenses.
3. Administrative expenses.

This grouping assists in the control of all indirect expenses in a similar manner, as did the subdivision of both materials and labour in the principles of control already explained.

The control of expenses will differ slightly in detail from that of materials or labour, as provision has firstly to be made for their "collection" and "allocation" to sub-accounts.

This collection and transfer are effected by preparing in the Cost Department a Journal entry of all items, as follows—

Dr. Expense Control Account.

Cr. General Ledger Adjustment Account.

The Expense Control Account is the means of controlling in total the expenses of a business, and all the debits to this account must agree with the total expenses as shown in the financial books. It must be noted, however, that the principles of control will be differently applied to each factory, and the above specimen entry is only given as a general example. It is sometimes possible, for instance, to charge the respective sub-expense accounts, which are described below, with many items direct from the financial books, and in such cases the total credits to the Establishment Expense Account will form the basis of reconciliation in total between the financial books and Cost Department.

The credits to the Expense Control Account will be effected

in a slightly different manner from that described for materials and labour, as the amounts must now be transferred to their respective sub-accounts, i.e.—

Factory Expense Account.

Selling Expense Account.

Administrative Expense Account.

Before the function of expense "control" can be completed, it is necessary that the total expenses be "allocated" to their respective sub-headings, and when this has been effected the results as shown by the expense allocation statement are journalized as follows—

Dr. Factory Expense Account	£
Selling Expense Account	£
Administrative Expense Account	
Cr. Expense Control Account	£

(Note that Factory Expense Account has already been debited with indirect wages.)

With regard to administrative expenses, when it is the practice to proportion these over both the Factory and Selling Departments, a further entry is made—

Dr. Factory Expense Account	£
Selling Expense Account	£
Cr. Administrative Expense Account	£

The effect of this entry is to close the Administrative Expense Account, and during the period this account was in operation there was effected reconciliation with the financial accounts in the first place, and in addition such expenses are "controlled" up to the point where the Factory and Selling Departments are charged with their due proportion.

The credits to the above accounts will arise in a similar manner as was described for materials and direct labour, and the amount of works expense recovered in costs is journalized as follows—

Dr. Work in Progress Account	
Cr. Factory Expense Account.	

As and when each component, batch of work, or works order is completed and passed into the finished stores (c), the value of expenses is journalized in a similar manner as was done with materials and labour, i.e.—

Dr. Finished Stock Account	£
Cr. Work in Progress Account	£

and thus effects complete control with expenses as was done with labour and materials.

Having dealt with each of the control accounts individually,

we are now in the position to journalize the total value of work, i.e. materials, labour, and expenses to the Finished Stores Control Account. We now, therefore, arrive at the point where the two previous entries can be combined with the entry described above for expenses, and so complete the working of all the control accounts up to the point where the goods enter the finished stores.

This transfer is effected by combining the three Journal entries given above for materials, labour, and works expenses in the following manner—

<i>Dr.</i> Finished Stock Control Account (c.)	£
<i>Cr.</i> Work in Progress Account—	
Materials Section	£
Labour Section	£
Expenses Section	£

The three entries referred to were given separately in order that the control of each element of cost could be more easily followed, as in practice the Finished Stores Account will only deal with the total cost of the products as illustrated in the above entry. It will be noted that at this point we are only concerned with the works or factory cost of goods made. The expenses of selling and distribution do not form part of the works cost or cost of production and their treatment—so far as cost control and reconciliation are concerned—will take a slightly different form from that already described for materials, labour, and works expenses.

In order to assist in the description of a method of applying the principles of cost control, as a means of reconciling the workings and the result of a costing system, it has been necessary to presuppose the existence of some form of financial or works organization. In the many examples already given it has been assumed that the function of production or manufacture is, from the point of view of “cost,” treated separately from selling and distribution. We have, therefore, provided the basis for reconciling all the items which enter into the works cost, or cost of production, with the total amount of expenditure as shown in the financial accounts.

When dealing with the control of materials, all purchases were subdivided into the three groups (a), (b), and (c), and a Control Account provided for each group. The control of raw materials (a) by means of the Raw Materials Control Account has already been effected, and there now remain the Factored Goods Control Account (b) and Manufactured Goods Control Account (c) to be dealt with.

With regard to the Manufactured Goods or Finished Stores Control Account, it will be noted that the entry given above transfers the cost value of complete work from the factory, i.e. Work in Progress Account, to the Finished Stores, and commences the operation of the section (c) referred to in regard to control and reconciliation. The issue of goods for packing and/or dispatch to customers will form the basis for crediting this account. The system in use for the movement of finished stocks will naturally differ with each factory, but for the purpose of illustration it is assumed that the Sale Department will issue an order or requisition to the superintendent of the finished stores, authorizing him to "move the following goods to Packing and Dispatch Department, etc." A stores requisition of a distinctive colour will be required for this purpose in order to differentiate from the stores requisition used in the factory, and also to facilitate the work of the Cost Department.

From the summaries of the above issues, which can conveniently be prepared in the process of cost finding, the Finished Stores Control Account is operated in a similar manner as was done with the raw material stores, but in this instance a "Cost of Sales Account" is charged in place of the Work in Progress Account, as follows—

<i>Dr.</i> Cost of Sales Account	£
(Issues from Finished Stores)	
<i>Cr.</i> Finished Stock Account	£

The Finished Stock Control Account is the means of controlling in total the values of finished goods, and the balance shown in this account at the end of each costing or financial period represents the factory cost of goods on hand.

To reconcile in detail the balance of the Finished Stock Account with the actual items in stock is very easily effected, if a proper system of stores records is in use, as the stock record cards (or ledgers) should provide the means of reconciliation in detail.

Mention of a Factored Goods Control Account (b) has already been made, and the entries in connection with the movement of factored goods on this account will be made in a similar manner as with those described above.

The Journal entries given above, which cover the final movement of stocks, form the basis of charging a Cost of Sales Account with the value of goods dispatched to customers. In the case of manufactured goods, it will be remembered that the Stock Control Account was debited *at factory cost*, but

with factored goods the Cost of Sales Account must be debited at "*purchase*" *price*. Control is now completed by debiting "cost of sales" with the correct proportion of selling and distribution expenses for the period under review.

Having ascertained the amount of selling expenses chargeable to the Cost of Sales Account, the amount is journalized—

<i>Dr.</i> Cost of Sales Account	
(Selling Expenses)	£
<i>Cr.</i> Selling Expense Control Account	£

ADJUSTMENTS. The many differences and adjustments that will invariably arise in practice have to be dealt with as, for instance, the under or over absorption of works expenses, etc., but as the precise nature of each adjustment will vary with each factory, due to the varying types of organization, it will only be possible to deal with those items that are more or less of a general character.

The question of expense adjustment will usually arise at the close of each costing period, and the method of dealing with these items will depend upon the method in use for allocating and recovering expenses in the cost accounts.

If the total factory expense for the year is assumed to be £12,000, there will be a monthly quota of, say, £1,000, that is, factory expenses should be absorbed at the rate of £1,000 per month, which is the basis of adjustment. It will, therefore, be seen that the adjustment of factory expense will not present any difficulty, as the difference between the monthly (or other period) quota is dealt with by transferring this difference to an Unabsorbed Factory Expense Account as follows—

<i>Dr.</i> Unabsorbed Factory Expense Account	£
<i>Cr.</i> To Factory Expense Account	£
(Being amount of factory expense unabsorbed for month ending)	

The object of treating the question of adjustments in this manner will be obvious if it is borne in mind that the aim is to reconcile costs with the actual expenditure incurred, and as shown in bulk in the financial books. All differences arising, therefore, between the amounts charged to or accounted for by the control accounts (which it must be remembered are simply summaries of the detailed costs as obtained in the process of cost finding) and the total expenditure, as shown by the financial accounts, must be dealt with in such a manner as will clearly indicate the cause or reason for the difference.

In the case of selling expenses a similar procedure will be followed, and a separate account opened for this purpose.

The method of treatment of any balance shown in the two Unabsorbed Expense Accounts will depend upon the policy of the management, but it is generally considered more correct if the amount is ultimately charged to Profit and Loss Account, and not charged as an additional expense to the factory cost.

It will be observed from the above remark that the allocation of factory expense, on the basis of the normal output capacity of the factory, is advocated in preference to the reduced output capacity that is usually arrived at by estimating the amount of business that might be secured during the period under review. The latter method is based upon the fluctuation of demand or state of trade, and it will readily be seen that such a method destroys any possibility of comparison of costing data or efficiencies. If sufficient orders are not secured to keep the factory running at full (or ordinary) time, the fact must be borne in mind, and the increased cost of production due to this cause should be clearly shown by the cost accounts, a factor which is only possible by the method advocated.

The adjustment of any differences arising with the Direct Labour and Direct Material Control Accounts will be less difficult than with expenses. With direct labour the details can be reconciled with greater precision than is possible with the various expense accounts; for instance, the exact amount of labour chargeable to the respective production orders or processes is easily ascertained by the aid of a proper system of time booking, likewise direct materials should also be capable of easy reconciliation by means of an efficient system of stores accounting.

The detailed items that may arise for adjustment in practice will vary according to the type of costing system in use, but the majority of errors will generally occur through the under or over charging of individual jobs or processes, and the entries necessary in such cases will therefore be obvious.

In conclusion it should be stated that the above description is only intended to explain the theory of cost control, and only sufficient details have been given to enable the reader to understand the principles involved. The actual method of control that will be used by any concern will be determined by the size of the plant, nature of the output, and the costing routine in use. For instance, if a plant is employed in producing standard products, the control will be comparatively

simple as compared with another concern engaged in the production of a variety of non-standard products. The use of standard manufacturing specifications, such as a Bill of Material, etc., greatly simplifies the routine of cost control.

A system of standard costing is perhaps the best example to quote where the principle of control is fairly simple to apply, as control is the foundation of the method. Standard costing requires the use of standard specifications for materials, labour, and production methods, and these specifications provide a ready means of accumulating the values of materials and labour consumed in production.

COST DEPARTMENT — EXPENSES OF. The total expenditure incurred in maintaining the Cost Department, which will include the salary of the cost accountant and his staff, stationery, postages, telephones, etc., will form part of the establishment expenses of the business.

The expense of this department is best dealt with by allocating direct to the administrative expense, although in some instances it may be apportioned over the factory, selling, and administrative sections of the business, according to the extent it is estimated that each benefits from the costing system.

In many instances the expense of running a costing system is regarded as an expense which should be charged to the factory, but such treatment of this item is not correct, as a Cost Department that is properly organized should be of benefit to the three sections of the business, and from this point of view the expense is essentially administrative in its proper sense, and should be dealt with accordingly.

The total expense of running a Cost Department and a costing system will usually be ascertained chiefly by direct allocation, as the various items of expense can be collected in this manner, but the sundry items of expenditure, such as for general stationery, office cleaning, lighting, heating, etc., will require to be apportioned.

It will be noted from the above that a Costing Department is essentially a "service" department, and differs from the usual service departments of a factory in that it renders a service to the business as a whole and not to one particular section.

COST ESTIMATING. The predetermination of the probable components of a cost when incurred under a given set of conditions.

Cost Estimating is carried out in many different ways,

variation of method being determined by the nature of the business and the kind of products manufactured or service rendered. The more simple form of estimating is where one or more articles have to be specially made to suit the requirements of a customer. In such cases, the estimate is firstly used as a means to arrive at a selling price, and when the order is secured it should be used as a means of checking and controlling the cost during the process of manufacture. Cost Estimating is also used when a new product is being placed upon the market, the estimate providing the basis for controlling the cost of production during the period the first batch is being manufactured. The cost of subsequent batches is controlled from the "Costs Finding" of the first batch, but the more advanced form of Cost Estimating is where the probable future costs of standard products are ascertained from the previous cost records and the estimates or "Standards" so arrived at used as a means to check and control production, selling and other expenses over a long period. Such a method of Cost Estimating when used in connection with a proper system of Cost Finding is often referred to as Standard Costing or Budgetary Control.

COST FINDING—METHODS OF. The particular method of cost finding used depends upon the nature of the industry and the class of product made. The output has to be measured and the mode of measurement depends absolutely on the form of the product and its method of manufacture. The cost of the output may have to be reckoned by the piece, pound, dozen, barrel, yard, article, etc., and by taking one of these classifications, and using arithmetical figures, the total can be obtained. In some trades the unit might be the article or batch of articles produced, a piece of machinery, a complete job or order as in an engineering works or a general repair shop, and in some cases in foundries. The unit in the case of builders or contractors would be the completed job or contract. An electric supply company would require the Board of Trade unit, or kilowatt hour.

In other trades the unit may be related to the "process," as with chemicals, tanning of leather, flour, bricks, and cement, etc.

Various methods of cost finding are used in practice, but these may be conveniently grouped under three main headings, i.e.—

- (1) Job costing.
- (2) Process costing.
- (3) Operating costing.

(1) **Job Costing**, which is very often referred to as the order method, is used when all the various items are charged to a specific order, which may be for one or a quantity of articles or, for a particular operation.

With this method the amount expended on labour and materials is charged to a particular order number together with its share of expenses, and the sum total constitutes the cost of the job, order or operation.

(2) **Process Costing** is employed in cases where there is a variety of processes or operations before a completed product is turned out, and where it is necessary to find the cost of each variety of operation. This method is particularly necessary where by-products occur or where one article out of a batch loses its identity during the process of manufacture. By this method comparison of the costs of different operations is possible and prices at each stage can be fixed. Process costing is used in most food producing factories, chemical works, and in the manufacture of paint, etc.

(3) **Operating Costing** is the essential method where services are rendered rather than goods produced. A single measurement demonstrates the work performed, though it may vary in kind as when a railway company reckons work performed as per ton mile or per passenger mile, etc., or an electric supply company per Board of Trade unit or kilowatt hour. Operating costs render possible the costing of transport undertakings and other public utility concerns, such as water works and gas works.

Many other terms are often used to denote a method of costing, but all of them relate to one of the above. Strictly speaking, the different terms have reference to the manner of application or operation of a "method" rather than a method itself; for instance—

Single or Output Costing is a term often used to denote the method of costing employed in such businesses as supply one rather than many products, and where it is desired to find the actual or average cost of one unit, weight, measurement or container per ton, per yard, 1,000 bricks or a sack of flour.

Such a term, however, merely refers to the job or process method of costing. Most manufacturing businesses use either the job or process method or a combination of the two when departmentalization or a division into processes is usual or desirable.

Departmental Costing is a term used when it is desired to ascertain the cost of the output of each department separately.

The method used in such cases is also the job or process, or a combination of the two.

Terminal Costing refers to the ascertainment of the cost of carrying out a contract, such as the erection of buildings, bridges or irrigation schemes, etc. This method of costing, however is the same as the job costing system.

Multiple Costing relates to the system used in such businesses as make a variety of goods which differ both in value, in kind, and in the number or variety of processes necessary for completion. These accounts, however, are based on the job costing method.

Class Cost Method is another term that is often used to denote the job costing method when applied to the costing of goods by classes instead of the unit or piece. In place of the cost being separately compiled for each article or piece of machinery, the cost will cover a group of orders of the same class of product. Whilst the job covers the "class" instead of the "piece," we still have the job costing method, but with a different unit of output to that usually associated with the more general form of job costing.

Operation Method of Costing is a term often used to indicate the job costing method where applied to the costing of goods by "operation" rather than by the piece or quantity. With many engineering plants this method is used as it will sometimes be found more convenient to cost certain articles or parts according to the operations performed on them, particularly in such cases where certain articles or parts must be stocked in a partly finished state for convenience in making up special orders.

With the above method of costing, the "job" covers the individual operation instead of the complete article or piece of machinery, and we therefore still have the job costing method, but with a different unit of output to that usually associated with the more general form of job costing.

Elements of Cost. To employ any of the above methods of costing it is necessary that money expended be analysed according to its use. This analysis firstly takes the form of segregating expenditure under the heads of—

- (1) Materials.
- (2) Labour.
- (3) Expenses.

Such are known as elements of cost and the sum of these elements comprises the total cost.

COST OF PRODUCTION. (See FACTORY COST.)

COST OF SALES ACCOUNT. An account which is used to ascertain the amount of profit made on sales each month or other period. A Cost of Sales Account should analyse the results either by departments or products and when used in connection with a Work in Progress Account, they may replace the orthodox Manufacturing Account. These two accounts show in a summarized form the results of both the manufacturing and sales activities of a concern, and are more useful in this direction than the general form of financial statement usually prepared from the ordinary books of account.

The example of a Cost of Sales Account given below illustrates the general principles of its construction only, as the actual form and number of sections in which this account may be drawn up in practice will depend upon the class of business and the nature and number of products sold, etc.

Form No. 41.

COST OF SALES ACCOUNT

FOR MONTH ENDING19. . .

	£		£
To Cost of Goods issued from Finished Stores and Despatched to Customers. . . .		By Sales Less Allowances . .	
„ Carriage on Goods Sold		„ Factory Cost of Goods Returned and Placed into Finished Stores	
„ Sales Expenses . .			
„ Goods Returned by Customers and placed into Finished Stores .			
„ Cost of rectifying Complaints of Customers.			
„ Balance, being Net Profit on Sales . .			

(See also COST CONTROL ACCOUNTS.)

COST PREMIUM WAGE INCENTIVE PLAN. This method gives the workers not only a direct interest in the time saved, but also endeavours to induce them to be economical in the use of raw material and to reduce certain items which are materially affected by the care or otherwise on their part;

for example, lighting, repairs to machinery and tools, and indirect material.

In order to avoid frequent alteration to the standard cost figure, the cost of raw material is calculated at a fixed price. As an example, let us take a hypothetical case—

	Per Ton.
	s. d.
Raw Material	20 —
Average Day Wage	60 —
Average Expense of Selected Items	15 —
TOTAL	95 —

The standard cost would then be considered to be 95s. per ton. Assume now that the total cost be reduced to 90s. per ton, the 5s. per ton saved forms the fund from which the premium will be paid. In some cases both management and workers share equally in the bonus, but in view of the fact that the saving effected is entirely due to the operative, this does not appear to be an equitable distribution.

Operatives are usually paid the premium in proportion to their daily rates. Of course, the efficiency values of men hardly ever coincide with their time rates, and in some cases age and length of service are taken into consideration, and to get the best out of this method the distribution should be on a scientific basis.

Charge hands and foremen are sometimes given special consideration. The method can be applied both on a time rate and piece rate basis. There are a number of ways in which the distribution can be effected and also of calculating it, but the above example will suffice to indicate the principles.

COST OF PRODUCTION. (See FACTORY COST.)

COST SUMMARIES. A form on which the detailed amounts of direct labour, direct materials, direct charges, and the proportion of expenses are finally summarized in order that a final or total cost of a job, order, or series of operations can be ascertained.

The extent to which cost summaries will be used and the form of ruling depends upon the method of cost finding, the nature and size of a business, and the amount of information required by the management. An example of summaries will only be given, therefore, to illustrate in a general manner their form and the amount and type of detailed figures usually given.

With many systems of job costing the summary of the total

cost of a job or works order is shown at the top of the sheet which is contained in the Job Cost Ledger.

The two specimen forms given (42) and (43) are almost self-explanatory. The form (42) indicates the general layout of a cost sheet suitable for summarizing the cost of works orders that have not been split up into sub-orders. Form (43), however, illustrates the type of summary used when the main works or production order has been analysed and sub-orders issued for each operation or the manufacture of each component part. In such cases the cost of each sub-order will firstly be summarized on form (42), and the total cost of the complete order obtained by summarizing the costs of all sub-orders on a form similar to (43).

The foot of either of the above forms is generally ruled to accommodate an analysis of labour, materials or time, according to requirements.

In those cases where the works order covers a large quantity of articles, it will sometimes be necessary to use separate cost sheets for summarizing the labour cost and material cost in addition to the final summaries referred to above. The necessity for these additional summaries will usually arise from the fact that a considerable number of items relating to both labour and materials require summarizing before the costs of a works order or sub-order can be completed, and in such cases a labour collecting sheet and material collecting sheet may be used.

The use of such forms, however, will be governed entirely by the actual routine of the Cost Department. For instance, instead of summarizing the labour costs of each worker upon the labour collecting sheets, it will sometimes be found more convenient for the cards to be totalled by the aid of an adding and listing machine, in which case the additional summary will not be required.

Likewise the stores requisition, relating to the order, may also be dealt with in this manner, and in such cases the cost summary ruled similar to forms (42) and (43) will usually be found sufficient for most purposes.

For illustrations and further description as to the use and compilation of labour cost collecting sheets and material cost collecting sheets, see under their respective headings.

The above forms of summaries are specially suitable for the job costing method, and where a system of process costing is in use a slightly different form will be needed. The illustration given (Form 44) is a process cost summary arranged to

the item in question, and it is recommended that the term "establishment expense" should, therefore, always be used.

CRANES AND HOISTS—DEPRECIATION OF. (See DEPRECIATION, also PLANT—DEPRECIATION OF.)

CRANES AND HOISTS—REPAIRS AND MAINTENANCE OF. The expenditure incurred in the maintenance and upkeep of all cranes and hoists, etc., is best collected by means of a system of service orders. In the case of large concerns, particularly in the heavy engineering industries, where each department is provided with its own lifting devices, the expense will be analysed to each department and included among the department's expenses.

With the smaller concerns there may be only, say, one electric crane provided for handling heavy raw materials and for general stores work, in addition to the handling of work in the heavy machine or erecting shops. In such cases the maintenance charges are debited to an account which will also receive debits for the power consumed, wages of crane driver and assistants, depreciation, etc. The total of this account is then apportioned over the respective shops according to the extent it is estimated each benefit from this service. In the case of very large firms the expense of "material handling" will be dealt with in costs as a separate item, and it is then necessary to analyse the repair and maintenance charges of cranes, etc., according to their use. In those instances where cranes are specially used for material handling, the segregation is a simple matter, but when a crane is used for a variety of purposes the repair charges are best dealt with upon the same principle as described above for small concerns, i.e. logical apportionment.

There may, however, be isolated instances where each crane driver can be provided with a time sheet on which to record the various classes of work and the time occupied on each, and this record may be used as a basis for analysing the expenses, but in practice this method will only be found practicable when a crane is occupied on each job for fairly long periods.

The question of depreciation will sometimes affect the method of dealing with repairs and maintenance charges, as it may be the practice to debit such charges to Depreciation Account for the reason that when establishing depreciation rates, the estimated cost of repairs and maintenance was taken into consideration. (See also REPAIRS AND MAINTENANCE, and SERVICE ORDERS.)

CREDIT AND STOWING MATERIALS. A description often given to that phase of a storekeeper's duties which relates to the acceptance from the producing departments of surplus materials on an order and the replacing of them in their respective bins, the issue of a stores credit note, and the entering of the item on a bin card.

This phase of storekeeping may be said to follow that of issue and recording. (See also STORES ROUTINE.)

DAY RATE. (See TIME RATE.)

DAY WAGE. (See TIME RATE.)

DAY WORK. (See TIME RATE.)

DEBENTURE CHARGES. (See DEBENTURES—INTEREST ON.)

DEBENTURES—INTEREST ON. The treatment in cost accounts of interest paid on debentures will depend upon the reasons for which the debentures are issued. The interest charges payable upon debentures that have been issued for short periods and for the specific purpose of providing extra working capital to finance a special contract are a direct charge to the particular job or work for which the money was obtained.

If interest charges in such cases are included among the establishment expenses and regarded as a general charge over the whole manufacturing and selling activities of the business, the ordinary output or work that has been performed, and for which the money was not required, will be carrying an expense for which it has received no benefits, whereas the special contract or work will not be charged with its correct amount of expense.

Debentures that have been issued to provide additional working capital for the whole business may be dealt with by either of the following methods—

(a) As a general charge to the business and included among establishment expenses.

(b) As a charge against gross profits.

(a) **Charge to Establishment Expenses.** The inclusion of debenture interest among establishment expenses may be dealt with by two methods—

(1) To regard the interest as a general charge over the whole business by firstly allocating it to administrative expense, and then arbitrarily to apportion it over the factory and selling departments, alternatively.

(2) In cases where the money obtained from the debentures

has been spent in the extension or erection and equipment of a new department or departments, to charge the interest to the expenses of such departments only.

The actual treatment of debenture interest in the cost accounts will not present much difficulty, as in the case of method 1 above being adopted, the expense will have been merged in with all other administrative expense items, which will be dealt with in total and apportioned over the respective departments or sections of the business upon some arbitrary basis. Each case, however, must be considered upon its own merits, as it may be that a larger portion of the extra capital will be spent upon, say, advertising, and only a small amount actually used in production. In such a case it would obviously be incorrect to charge the interest to the Factory and Selling Departments in equal proportion. On the other hand, if the greater part of the money is expended in new plant, then the factory should bear its correct share of the expense.

In the case of method 2 the interest expense will be allocated direct to the department or departments and not spread over the whole factory, but if a machine rate is being used the item can be dealt with more scientifically if the amount spent in the purchase of new machine tools and new buildings is separately ascertained, as this will then enable each machine tool or group of machines to be charged its correct amount.

(b) **Charge Against Gross Profits.** When interest on debentures is regarded as a charge against the gross profits of the business, the item will not appear in the cost accounts, but will be dealt with at the end of each financial period by transferring the amount direct to the Profit and Loss Appropriation Account.

(For general consideration of interest charges see **INTEREST ON CAPITAL.**)

DEFECTIVE WORK—COST OF. The treatment of losses arising from defective work will depend upon the nature of the products made, the amount of expense involved, and the cause of such defects.

With some industries slight defects rectifiable at very little expense arise during the course of manufacture. These may be regarded as unavoidable within limits, and in such cases the cost may conveniently be charged against the product or process concerned, and providing some means be available of checking the amount or quantity of the defects, no elaborate

system is needed, but with those concerns which make a variety of products and which employ different grades of labour, the expense incurred by defective work may be a very serious drain upon profits.

Defective work will largely arise through carelessness on the part of an employee, whether in setting up his machine, performing a particular operation, or for any other reason. On the other hand defective work may be caused by the management or foremen if verbal instructions are given, and in such cases the operatives must not be blamed. The collection and summarizing of all expenses incurred through defective work should, therefore, be carried out in such a manner that the cause is shown as well as the total cost.

With some concerns a special staff may be engaged upon the rectification of spoilt work and the collection of the cost then becomes a comparatively easy matter. This method, however, is only practicable in certain of the process industries.

When a variety of standard products is being made, special service orders should be set up and the time and materials relating to such defects or their rectification charged to them, and at the end of a cost period the total of such orders may be dealt with by any of the following methods—

1. Transferred to the Departmental Expense Account.
2. Spread over the cost of the products concerned.
3. Regarded as a loss, and after showing the expense against the department or product concerned, the amount transferred to profit and loss.

With regard to defects which arise in connection with special articles made against a customer's order, the cost should be shown as a separate item against the order in question. (See also MANUFACTURED GOODS—REJECTION OF.)

DELIVERY EXPENSE. (See SELLING EXPENSE.)

DEPARTMENTAL COSTING. (See COST FINDING—METHODS OF.)

DEPARTMENTAL RATE METHOD OF RECOVERING EXPENSES. The term "departmental rate" is generally and erroneously used as indicating a particular method of recovering expenses in costs in just the same manner as one may refer to the direct labour hour method, the percentage on direct labour method, the machine rate method, or the percentage on prime cost method. Strictly speaking, the term has reference to the manner of application or operation of a

“ method ” rather than a method itself. For instance, there may be used the direct labour hour method on the basis of one general hourly rate for the whole factory, whereas on the contrary a separate hourly rate may be used for each department, and again the percentage on direct labour method may be applied as one general percentage rate or as a separate percentage rate for each department. Whenever any of the above or other methods are applied on a departmental basis, the use of the term “ departmental rate ” is not only ambiguous but liable to be very misleading.

The desirability of applying any method of recovering expenses upon a departmental basis will depend upon the nature of the articles or products made and the method of manufacture. With those cases where the work performed in each department is uniform in character, the several methods *may* be applied as one general rate over the whole factory, but where machinery is used to a varying degree in one or more departments, or when conditions throughout the factory are not uniform, it is generally found necessary to use different rates for each department.

The nature of manufacturing operations in almost every factory is such that a general expense rate should rarely be used, as one will seldom find that conditions are uniform throughout all departments. With engineering works especially the work performed will vary to a considerable extent, some of the products requiring the use of machinery throughout, whereas others will need the use of little or no machinery. When such conditions prevail, the recovery of the factory expenses in costs on the basis of one general rate for the whole factory will obviously produce incorrect and misleading costs, as the article or process which requires the use of expensive machinery should have charged to it a greater proportion of the factory expenses than one which may be all hand work or partly hand work and partly machine work.

When the process method of cost finding is used, the departmentalization of the factory expenses in the majority of cases will follow as a natural sequence with the costing operations.

Percentage on Direct Labour. The recovery of factory expenses by this method, and using a separate rate for each department, will be carried out in the manner indicated under its title heading, excepting that in this instance the total factory expense will be analysed to departments

Assuming that the factory expenses total £151,050 and

direct labour £159,000, the expense rate will be calculated for each department as follows—

		DEPARTMENTS.				
		A.	B.	C.	D.	Etc.
Total Factory Expense . . .	£ 151,050	£ 25,000	£ 40,000	£ 30,000	£ 56,050	£ —
Total Direct Labour . . .	159,000	30,000	50,000	25,000	54,000	—
Expense Rate .	—	83%	80%	120%	104%	—

The amount of factory expenses to be recovered on each job or process would, therefore, be ascertained by adding to the amount of direct labour of a department a sum calculated on the percentage rate applicable to the department in question, as follows—

	£	s.	d.	£	s.	d.
Direct Materials				123	—	—
Direct Labour—						
Dept. A.	50	—	—			
Dept. B.	45	—	—			
Dept. D.	12	—	—			
				107	—	—
Factory Expenses—				230	—	—
Dept. A. 83% on £50	41	10	—			
Dept. B. 80% on £45	36	—	—			
Dept. D. 104% on £12	12	9	7			
				89	19	7
TOTAL FACTORY COST				£319	19	7

(See also PERCENTAGE ON DIRECT LABOUR METHOD OF RECOVERING EXPENSES.)

Percentage on Prime Cost. The application upon a departmental basis of the percentage on prime cost method can seldom be done, as the value of materials used by each department will rarely, if ever, form an equal part of the cost of every department through which the product passes. Furthermore, as the costs of a department may only comprise labour and expenses, the prime cost method can practically be dismissed as a method not lending itself to departmentalization.

Direct Labour Hour Method. The direct labour hour method will usually be applied on a departmental basis, because the use of a general hourly rate for the whole factory will not give any better results than the percentage on direct labour method. It should be noted, however, that in the majority of cases the direct labour hour rate must be calculated separately for each department, if greater accuracy than that given by the percentage method is desired. Departmentalization in this instance is almost implied by the method itself, because the time taken on the job is the basis of recovery.

The calculation of a departmental hour rate is very simple and proceeds upon similar lines to that given above for the percentage method, excepting that in this instance the number of direct labour hours of all the direct workers engaged in each department become the divisor as follows—

		DEPARTMENTS.				
		A.	B.	C.	D.	Etc.
Total Factory Expenses .	£ 151,050	£ 25,000	£ 40,000	£ 30,000	£ 56,050	£ —
Direct Labour Hours . .	—	250,000	640,000	248,276	373,666	—
Expense Rate per Hour .	—	2/-	1/3	2/5	3/-	—

The amount of factory expense to be recovered on each job is ascertained by multiplying the number of direct labour hours spent on the job by the department's expense rate, e.g.—

	£	s.	d.	£	s.	d.
Direct Materials				105	—	—
Direct Labour—						
Dept. A.	48	—	—			
Dept. C.	39	—	—			
Dept. D.	15	—	—			
				102	—	—
				207	—	—
Factory Expense—						
Dept. A. 491 hours at 2/-	49	2	—			
Dept. C. 280 hours at 2/5	33	16	8			
Dept. D. 120 hours at 3/	18	—	—			
				100	18	8
TOTAL FACTORY COST	£307	18	8			

Machine Rate Method. The machine rate method can rarely be used as the only basis for recovering the whole of the factory expenses, as there will invariably be one or more departments that will be all hand work or partly hand work and partly machine work in addition to those departments that are entirely composed of machine work. A separate method is generally used, therefore, for recovering those expenses which are not capable of direct allocation to the machines, and in this direction the machine rate method is generally used in conjunction with the direct labour hour method.

The use of a machine rate implies departmentalization in most cases, especially when the departments coincide with the various types or batteries of machine tools. With some concerns, however, all the machines may be located in one part of a building, and in such cases a "department" may be a group of machines. On the other hand, if a separate machine rate is used for the individual machines, the question of departmentalization will chiefly affect the general shop expense rate, i.e. the direct hourly rate.

The application of the machine rate method is fully described under its heading, and reference should be made thereto.

DEPARTMENTS. The term "department" as usually employed carries a somewhat loose significance, and may mean anything from a whole building down to a few square feet in a small shed or room. It may mean a division of activity; take, as example, Power Department or, in the case of non-engineering industries, the Repair Department, the latter generally being a machine shop forming the headquarters of the repair staff. Generally, there is a Stores Department in most works and this may, or may not, be identified with a single building. Different productive shops or the location wherein a particular process or operation is carried on, are called departments, and it sometimes happens that more than one such productive department are covered by the same roof.

Such terms as "Cash Department," "Purchasing Department," "Wages Department" have no other signification than to indicate clerical work connected with cash, purchasing, and pay respectively. "Stores Department" similarly means the whole system of handling, receiving and issuing, and the keeping or storage of materials or goods. The "Cost Department" means the whole of the activity covered by the cost accountant. The "Power Department" includes all activity relating to the generation and transmission of power—steam

or electric. These latter departments are called "expense" or "service" departments, rendering service to all, or any manufacturing departments. The cost of conducting them is ultimately distributed over the production or manufacturing departments. It is advisable to split up manufacturing activity into as many departments as are reasonably required by the natural processes of production. For this purpose it may often be necessary to consider one building as containing several departments.

DEPARTMENTS—CLASSIFICATION OF. Correct departmentalization of a plant is important, and the chief matters to be considered that affect the plant or manufacturing departments are—

1. The natural divisions into which the manufacturing processes can be segregated.

2. The location of each division.

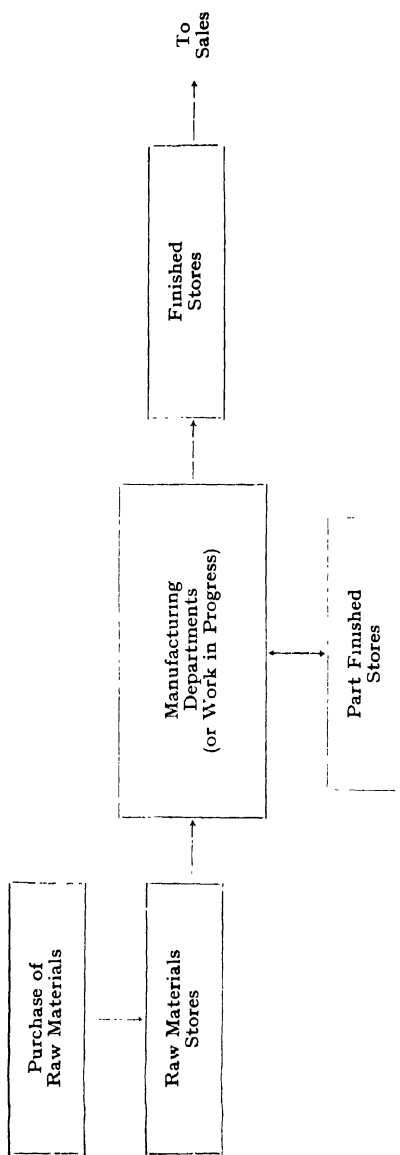
3. The proper division of responsibility.

1. **The natural divisions into which the manufacturing processes can be segregated** depend upon the type of industry and the size of the plant. In some cases a plant will not lend itself to correct departmentalization owing to the buildings being of unsuitable design or where a business has outgrown its present accommodation and in such cases rebuilding is the only correct course to follow, but where this is not possible one must make the best use of the space available.

The process through which material will flow is more or less similar in most industries. Raw materials must firstly be purchased before production can commence and suitable accommodation must be provided for their storage. We, therefore, commence with a Raw Material Stores. The next process is to issue these materials into the manufacturing departments for work to be performed on them: the issue of such materials is to "Work in Process." Some of this material may be made up into parts and held for a time until they can be assembled into the finished products and a "Finished Part Stores" becomes necessary. These parts when required are then issued from the Finished Part Stores for assembly into the complete product or article and the final product then passes on to the "Finished Stock." The process through which a manufactured product will pass and as described above, is the basis for "departmentalizing" the cost accounting records for convenience of control, and this also provides the first classification of production which is as follows—

- (i) Raw Material Stores.

CHART SHOWING THE FLOW OF MANUFACTURE AND OF COSTING



- (ii) Work in Process (i.e. Manufacturing Departments).
- (iii) Finished Parts Stores.
- (iv) Finished Stores.

The first division of the flow of manufacture, and, incidentally, of cost accountancy also, is more clearly illustrated by the chart on page 134.

The subdivision of the manufacturing departments or production methods will provide the basis for departments in most cases, but the number and kinds of departments which any one business can be divided into will not be the same in every case, as each factory will require special treatment. But, in general, manufacturing departments may be firstly classified into three groups.

- (i) Manufacturing (or Producing) Departments.
- (ii) Service (or Non Producing) Departments.
- (iii) Miscellaneous Departments.

The term "department" as usually employed carries a somewhat loose significance, and may mean anything from a whole building down to a few square feet in a small shed or room. It may mean a division of activity; take, for example, Power Department, or, in the case of non-engineering industries, the Repair Department, the latter generally being a machine shop forming the headquarters of the repair staff. Generally, there is a Stores Department in most plants and this may, or may not, be identified with a single building. Different productive shops, or the location wherein a particular process or operation is carried on, are called departments, and it sometimes happens that more than one such productive department are covered by the same roof.

Such terms as "Cash Department," "Purchasing Department," "Wages Department," have no other signification than to indicate clerical work connected with cash, purchasing, and pay respectively. "Stores Department" similarly means the whole system of handling, receiving and issuing, and the keeping or storage of materials or goods. The "Cost Department" means the whole of the activity covered by the cost accountant. The "Power Department" includes all activity relating to the generation and transmission of power—steam or electric. These latter departments are called "expense" departments, rendering service to all, or any manufacturing departments. The cost of conducting them is ultimately distributed over the production or manufacturing departments. It is advisable to split up manufacturing activity into

as many departments as are reasonably required by the natural processes of production. For this purpose it may often be necessary to consider one building as containing several departments.

(i) **Manufacturing Departments** may be said to be the natural process division of any business, and, as the qualification infers, cover the direct manufacture and such departments will therefore include those that are directly engaged in the making of saleable products.

The activities of these departments embrace all work performed, on materials that are converted or formed into the finished product, as well as the work upon materials or component parts that may be placed into the part-finished stores and requisitioned at a later date for final assembly into the complete product.

When deciding upon the classification of the producing departments due consideration must be given to the various kinds of work performed on each article, the relation one operation or process has to another, and the unit of output that will be used as the basis for calculating its cost.

The actual number of departments and the designation given to each will depend upon the size of the factory and nature of the work done. The following examples will be sufficient to indicate in a general manner the principles of departmental classification, but it should be noted that if two factories are making the same product and both use the same process of manufacture, each will require a different classification, as the conditions that prevail at the one factory will not necessarily apply to both.

ELECTRICAL ENGINEERING—

Machine Shops, such as Turning, Milling, Drilling, Planing, etc.

Foundry, which may be further departmentalized into Melting, Moulding, Coremaking, and Finishing Departments.

Winding Department, which may be further divided into Coil Winding Department, Armature Winding Department, etc.

Plating Department.

Paint Department.

Lacquer and Enamelling Department.

Hardening and Annealing Department.

Vulcanizing Department.

Assembly Department.

Inspection Department.
Test Department.

READY-MADE CLOTHING BUSINESS—

Cutting Department.
Machining Department.
Hand Sewing Department.
Trimming Department.
Inspection Department.
Pressing and Packing Department.

PAINT MANUFACTURING—

Heavy Grinding Department.
Heavy Mixing Department.
Light Grinding Department.
Light Mixing Department.
Thinning.
Tinting.
Filling Department, which may be further departmentalized into Straining, Filling, Sealing Containers, and Polishing.
Labelling.

COTTON SPINNING AND WEAVING—

Blowroom (or Cleaning).
Carding.
Winding.
Warping.
Sizing.
Twisting.
Weaving.

TIN BOX AND CANISTER MAKING—

Small Box Work :
Stamping Department.
Beading Department.
Lipping Department.
Can and Canister Work :
Cutting Department.
Notching Department.
Folding Department.
Rolling Department.
Grooving Department.
Soldering and Embossing Department.
Flanging Department.

Stamping Department.

Double Seaming.

Beading.

Printing, comprising departments as follows—

Coating.

Colour Printing.

Varnishing and Lacquering.

Stoving.

It will be noted from the above examples that a department will generally coincide with the nature of the work performed, although the smaller plant may regard as a department a section of the factory that contains more than the one process. In a small plant manufacturing cans and canisters the Seaming and Beading operations may be performed in the one department, and in such cases it is necessary that the Cost Accounts be arranged to separate the costs of each process within this one department.

A department may be regarded as a "Productive Centre" and the object in dividing a plant into departments or production centres is for the purpose of supervision and control.

(ii) **Service Departments.** The term "Service" (or "Expense") Department implies that the function of such departments is to render service to all, or any, of the manufacturing departments. The exact size and specific functions of these auxiliary departments will vary in different industries. Frequently it may be decided to amalgamate two or even more functions into one department. A reasonably sized factory engaged in engineering may have Expense or Service Departments similar to the following—

Planning Department.

Progress Department.

Drawing Office.

Millwrights' Department.

Plant—Engineers' Department.

Welfare Department.

Tool Room.

Power Department.

Inspection or Viewing Department.

Receiving Department.

Stores Department.

Estimating Department.

Cost and Wages Department.

Rate Fixing Department.

Employment Department.

A brief outline of the functions performed by some of these departments will be found helpful.

Costing and Wages Department. The main functions of this department are quite apparent. The cost accountant is responsible for the operation of the entire cost system, in such a manner that every expense of the business is properly and automatically recorded on time cards, material sheets, job or cost cards, etc. His duties are wide and he is called upon for various figures covering every step in the process of manufacture, sale, and distribution of the company's products.

Planning Department. This department is concerned with the technical side of production throughout the factory. The course of procedure in the various processes of production is arranged and determined by this department. The issuing of Production orders (in conjunction with the plant manager) and planning of work throughout the factory, may sometimes form part of the numerous duties performed by the Planning Department.

Estimating Department. The main functions of this department are quite apparent, and with most concerns it forms a section of the Costing Department.

Progress Department. Responsible for the "progressing" of the work throughout the various production departments. This department will sometimes be combined with the Planning Department as the function of Planning and Progressing are closely related. Production is firstly "planned" and then "progressed" through the factory in order to ensure that the manufactured products are completed according to schedule. These departments operate very closely to the Costing Department as they are the pivot upon which the whole production system revolves.

(iii) **Miscellaneous Departments.** In almost every factory there will be one or more departments whose work will be partly for production and partly for service; for example, the tool room may manufacture small tools for general purposes as well as special tools for use on individual works orders. In the former case the cost is a charge to the factory expenses, and the latter a direct charge to the particular works order for which the tools were specially made. Other examples of departments whose work is partly service and partly productive are the Carpenters' Department, Millwrights' Department, Repair Shop, Experimental Department, Blacksmiths' Shop, Pattern Shop, etc.

The carpenters may be engaged in making packing cases for

special orders in addition to cases, etc., for general use, also work on fixtures and fittings, benches, etc., which may be a charge to repairs and maintenance or to capital; similarly, the pattern shop may be engaged upon patterns both for special orders and for general use.

Departments of this nature are best classified as miscellaneous departments, as the cost of maintaining them will require slightly different treatment from either the producing departments or those that are purely service departments.

The materials used by miscellaneous departments and the wages paid, etc., will be charged either to service orders or production orders, according to the nature of the work performed. Work on service orders will then be charged to the producing departments or to capital, if new plant, etc., has been made.

In some instances the departments mentioned above are more conveniently classified as producing departments, and in such cases care must be taken to ensure that they receive credit for both direct and indirect work.

2. Location of Departments. The location of each division or manufacturing department will need to be arranged so that production routine is not delayed by the departments being at too great a distance from one another. Material Handling Expense is affected if work has to be carried too far or if a great deal of handling is necessary. The flow of production or the natural sequence of operations will to a large extent determine the location of departments. In cases where a business has outgrown its present accommodation, however, this natural sequence of operations will be broken and most departments will have to be located according to the space available, but this arrangement will never be satisfactory.

In following the sequence of operations consideration must be given to the nature of the work that is to be performed as heavy work is best done on the ground or lower floors and the lighter work on the upper floors. Certain types of work will also need more light than others and unless the manufacture is located in a building that has been specially designed for the particular business it is practically impossible to obtain correct departmentalization with the resultant efficiency and economy.

3. Division of Responsibility. The proper division of responsibility is equally as important as the correct departmentalization of a plant if efficiency is to be attained. Responsibility must be clearly defined for the physical movement of products

as well as for the financial recording of such movements. The Plant Manager and Cost Accountant must, therefore, be intimately related as regards their respective functions. The Plant Manager will be solely responsible for the physical aspects of production and for keeping his costs within the limits specified. The Cost Accountant is responsible for the accuracy of the figures he produces, and as this depends to a large extent upon the efficiency with which the clerical routine in the plant will operate it is obvious that both the Plant Manager and Cost Accountant must co-operate very closely.

The division of responsibility within the plant will be governed by the size of the business. In some cases a Plant Manager is able with the aid of his foremen to supervise all the workers employed, but with large concerns department managers are needed. Department managers should never be expected to perform clerical work. Their responsibility is for the quantity and quality of production only. If clerical work has to be performed, shop clerks should be provided for this purpose and in this direction it is preferable that any shop clerks be either under the control of the Planning Department or the Cost Accountant. If the shop clerks are recording the production as completed, then the Planning Department are the logical supervisors of such help as they require accuracy. Where a Planning Department is not operating, the Cost Accountant should have control.

DEPARTMENTS—EXPENSE. (See SERVICE DEPARTMENTS.)

DEPARTMENTS—PRODUCTION. (See MANUFACTURING DEPARTMENTS.)

DEPARTMENTS—SERVICE. (See SERVICE DEPARTMENTS.)

DEPOSIT ACCOUNTS—INTEREST ON. (See BANK DEPOSIT—INTEREST ON.)

DEPRECIATION. The gradual decrease in value of an asset from any cause. The amount of depreciation "written off" each year in the financial accounts will form part of the establishment expenses, and the allocation or apportionment of the amount to the factory, selling, and administrative sections of a business will depend upon the kind of assets and their relation to the respective sections. For instance, the whole of the depreciation on producing machinery is a charge to factory expense, whereas the amount relating to buildings will be allocated to the three sections on the basis of space occupied.

Reference has been made to the amount of depreciation "written off" in the financial accounts each year, and in this direction it should be noted that circumstances may alter cases, as when a company has made large profits and a very liberal amount of depreciation is charged to Profit and Loss Account, while on the contrary an insufficient amount may be "written off" during periods of trade depression. When such conditions prevail and also in those cases where the plant and machinery assets, for instance, may be grouped into one account and a general percentage rate used, it is desirable that the various assets be classified and a correct rate fixed for each class or piece of equipment.

In the majority of instances it is best to use the "straight line" method when calculating depreciation, and whilst the question of depreciation cannot be considered separately from that of repairs and maintenance, it will nevertheless be desirable that the amounts relating to each be recorded separately in the Costing Department.

When the amount of depreciation included in the financial accounts does not agree with the figures used in the cost accounts, a Depreciation Adjustment Account should be opened in the Cost Ledgers for convenience of reconciliation.

The nature of the plant assets belonging to some concerns, however, may be such that one general rate can be used for each class, and in these circumstances the Adjustment Account may not be necessary.

A detailed record of depreciation relating to each piece of equipment should be kept, and the form for this purpose may be ruled similar to the plant record card shown under that heading.

The incidence of depreciation is very similar to that of repairs and maintenance and the principles of allocation or analysis will, therefore, follow the lines already indicated under that heading.

DEVELOPMENT EXPENSES. (See EXPERIMENTAL AND DEVELOPMENT EXPENSES)

DIEMER COMBINED BONUS AND PREMIUM METHOD.

The daily rate is guaranteed, and it is calculated by taking 70 per cent of the time taken, adding to it 50 per cent of the standard time, and multiplying the sum by the hourly rate. Bonus starts at 100 per cent when there is a "step" of 20 per cent. The increase above this point is considerably lower than with most other systems.

It is not very strong in its effects, but if conditions are not

completely standardized, it is a comparatively safe and easy plan to install.

The cost per piece produced is low—subject to it being possible to keep the workers from falling back on the guarantee. (See also **WAGE INCENTIVE.**)

DIFFERENTIAL PIECE WORK. (See **TAYLOR DIFFERENTIAL PIECE RATE.**)

DIRECT CHARGES. The total expenses of a business which constitute the third element of cost are subdivided into two groups; firstly, there are expenses that have been specially incurred for specific orders and can, therefore, be charged direct to a specific article, order or process; and secondly, the expenses which have been incurred in the general running of a business and which can only be dealt with as a general charge over the whole business.

The former are known as direct expenses and the latter as indirect expenses.

Direct expenses may include such items as the cost of any assistance or facilities used for a special article, order or process. For instance, special travelling and other incidental expenses, heavy charges incurred for carriage on materials or parts, or any expense incurred in the hire of special machinery, such as a portable crane or an engine, are a direct charge to an order or process.

Direct expenses are sometimes referred to as direct charges, but the former term is preferable if uniformity of costing terminology is desired. (See also **ELEMENTS OF COST.**)

DIRECT COST. (See **DIRECT EXPENSE.**)

DIRECT EXPENSE. Any expenses that have been specially incurred for specific orders and can, therefore, be charged direct to the specific job, operation or process. Such expenses will include such assistance or facilities used for a special order or process, i.e. a portable crane or engine or scaffolding may be hired for a particular job. Furthermore, special charges are often incurred when carriage has to be paid on special materials or parts obtained for an order. In such cases the carriage, other than small sundry amounts, is a direct charge to the job, order or process.

DIRECT LABOUR. The labour used in performing work directly upon a saleable article, and which can be measured and correctly allocated to the article, order or process.

The labour hired by a manufacturing concern will generally be used in two ways. It may be employed in performing work directly upon a saleable article or product, or it may be

usefully employed on such work as sweeping and cleaning, general labouring, carrying materials from the stores to the work benches, repairing the plant and machinery, or in supervising the workers of a department.

In the case of the former, the labour employed in performing work "directly" on a saleable product can be measured and correctly allocated to the article. Such labour is therefore classified as "direct labour."

With the latter, however, it is not possible to charge it to any specific article or order on the basis of the work done towards its completion. Such labour is, therefore, classified as "indirect labour."

DIRECT LABOUR HOUR METHOD OF RECOVERING EXPENSES. The computation and recovery of expenses as a rate per direct labour hour are based on the time taken to produce an article. This method is very similar to the percentage on direct labour method, excepting that expenses are recovered at a rate per direct labour hour instead of by a percentage on the amount of direct wages paid; in other words, the number of hours becomes the basis instead of the amount paid for the hours.

The work involved in the calculation of an hourly rate is represented by the following formula—

$$\frac{\text{Estimated total of expenses for period}}{\text{Estimated total of direct labour hours for period}}$$

The estimate of expenses and direct labour hours may be prepared by using the figures of previous accounts or calculated according to the maximum or reduced output capacity of the factory, and the principles involved in estimating the total expenses for the year or other period are fully dealt with under the general consideration of "establishment expense."

A close estimate of the total direct labour hours can only be arrived at when all the factors which enter into the estimate are dealt with individually and scientifically, and as the correct application of this method depends upon the precision with which this estimating is carried out, attention should be given to every detail.

The direct labour hour method may be calculated as one general rate for the whole factory or a separate rate can be used for each department. If a general rate for the whole factory is used, however, the method offers practically no advantage over the percentage on direct labour method, but

when applied on a departmental basis it will give more accurate results.

The advantage of this method over the percentage on direct labour or prime cost methods lies chiefly in the direction of the time element between a fast worker and a slow worker ; for instance, if two men paid by the piece work method are engaged upon similar work and one completes his job in 30 hours, the other in 20 hours, the slow worker will use more light, power, supervision, etc. The amount of expense charged to each job under this method will, therefore, be more in proportion to the extent to which power, supervision, and the various facilities or services have been used, as shown by the following examples—

WORKER NO. 1.				WORKER NO. 2.			
	£	s.	d.		£	s.	d.
Materials	3	-	-	Materials	3	-	-
Direct Labour—				Direct Labour—			
Piece Work Price . .	2	10	-	Piece Work Price . .	2	10	-
Time taken, 20 hrs.				Time taken, 30 hrs.			
	<hr/>				<hr/>		
	£5	10	-		£5	10	-
Factory Expenses—				Factory Expenses—			
20 hrs. at 2/6 per hr.	2	10	-	30 hrs. at 2/6 per hr.	3	15	-
	<hr/>				<hr/>		
TOTAL COST	£8	-	-		£9	5	-
	<hr/>				<hr/>		

If the percentage on direct labour method had been used, the percentage addition would be the same in each case.

It will be seen from the above that providing the work done in any one department is uniform in character, that is, either all hand work or all machine work, this method will give accurate results when applied upon a departmental basis, but in those cases where machinery is used to a varying degree in one or more departments, the method makes no allowance for a job that requires the use of machinery or one that may be all hand work. This is a serious fault, because an article which will need the use of machinery should have charged to it a greater proportion of the factory expenses than one which requires the use of little or no machinery.

In order to overcome the one objection to the method, the expenses of those departments which use machinery are sometimes divided, and a separate rate calculated for both hand work and machine work ; in other words, the factory expenses are recovered by a combination of the direct labour hour method and the machine rate method.

In some cases, however, the departmental expenses that

go to make up the "supplemental or super rate," that is, the rates applicable to machine work only, may all be grouped for each department, and a "general" supplementary rate used for all the machines in the one department. This method of fixing the supplementary rate, however, will only completely eliminate the weakness mentioned above, if all the machines in each department perform similar operations and are of the same size and type, etc. With those factories where a variety of machine tools are used in any one department, the supplementary rate should be fixed on the same basis as machine rates, and a separate rate used for each machine or group of machines.

When applied in conjunction with a supplementary rate for the machine expense, the direct labour method is undoubtedly one of the best methods that can be used if both hand work and machine work is carried on in the same factory, as due allowance will then be given to all the varying factors appertaining to the majority of such concerns—factors which may be summarized as follows—

- (1) The time element of the job.
- (2) Work which may wholly or partly require the use of machinery.
- (3) Work which is partly hand work and partly machinework.
- (4) Jobs which are all hand work.

When the combined method is used, the factory expense will be added to costs in two amounts, but the extra amount of clerical work involved is much less than may appear at the outset, because on the one hand the various rates will be calculated only once in each year, if they are based on the normal maximum output capacity of the factory, which it may be noted is the correct basis.

On the other hand, the recording of the number of hours against each job or order is quite a simple matter if the routine in connection with the booking of time to jobs or processes is properly carried out.

DIRECT MATERIALS. Such materials as are worked upon for the specific purpose of changing the form or shape, or combined with other materials in order to produce a saleable product are known as direct materials, as the manner in which they are used is such that they can be correctly measured and charged direct to an article, order or process.

The materials consumed by a manufacturing concern are classified under two broad headings, viz., "direct materials" and "indirect materials."

DIRECT PURCHASES. Materials or parts specially purchased for use on a specific job, order or process, are dealt with as a direct charge to the job or order for which they are required. Materials which are capable of this direct analysis will not include general materials or stores items that are required for general production purposes.

DIRECT WAGES. (See DIRECT LABOUR)

DIRECTORS' FEES. The fees paid to directors in connection with the attendance at board meetings form part of the establishment expense, and are allocated to administrative expense.

DIRECTORS' SALARIES. The salaries paid to directors who occupy a managerial position form part of the establishment expenses of a business, and are allocated according to the nature of the work done; for instance, if the work performed is confined to the factory departments, it would be a charge to factory expenses.

If a director's activities refer to more than one section of the business, the salary is apportioned over the respective departments according to the extent it is estimated each benefit from his services.

A salary or fee paid to a director in connection with any special work which the board have requested him to carry out, and which may extend over a long period of time, should be dealt with upon the same principle as above, but any special work of short duration is best charged to administrative expenses.

DISCOUNTS ALLOWED. The total amount of discounts allowed to customers on settling their accounts may sometimes be deducted from the total sales for the period, in which case the item will not affect the cost accounts. When discounts allowed are shown separately in the accounts, however, the item may then be dealt with by including it among the sales expenses. Most concerns prefer that all cash and monthly discounts allowed to customers be regarded as a deduction from the sales, and this procedure is the more correct.

It must be noted that the item "discounts allowed" will not include the ordinary trade discounts, which are deducted from the sales invoices at the time they are made out, but only such allowances as are made when paying accounts and which are usually known as cash discounts.

With some concerns a Discount Account is operated in the financial books which receives discounts both allowed and received, and in such cases the balance of the account will

be carried forward to the Profit and Loss Account, and the item regarded as a debit or credit to administrative expenses in the cost accounts. The Discount Account may, however, be analysed and dealt with by either of the methods described above.

DISCOUNTS RECEIVED. The total cash discounts received which are deducted at the time of paying the various creditors' accounts may be dealt with either—

(a) As a credit to establishment expense.

(b) As a deduction from the total purchases.

When discounts received are credited to expenses, they may be apportioned over the Factory, Selling, and Administrative Departments, according to the value of purchases made on behalf of the respective sections.

If the expenses incidental to the handling and purchasing of materials are recovered in costs as a separate item to the remaining factory expenses, the amount of discounts would then be credited to material expense.

With small concerns, and in all cases where the total purchases and the amount of discount received are not large, the item is best dealt with by being allocated in total to administrative expense.

The deduction of discounts from the value of purchases may be the procedure of some concerns, but the use of Material or Stores Control Accounts will render this method unsuitable.

With some concerns a Discount Account may be operated in the financial books, and in such cases both discounts received and discounts allowed will be transferred to this account, and the balance carried forward to Profit and Loss Account. The item may then be regarded as a debit or credit to administrative expense. Alternatively, the account must be analysed and dealt with by either of the methods described above.

Discounts received, and dealt with as above, only refer to "cash" discounts which are deducted from the various creditors' accounts at the time of payment, and not the ordinary or trade discounts which are made on the purchase invoice.

DISTRIBUTION COST. (See SELLING AND DISTRIBUTION EXPENSE.)

DISTRIBUTION EXPENSE. (See SELLING AND DISTRIBUTION EXPENSE.)

DIVIDENDS. The amount distributed by a company to its shareholders by way of dividends is an allocation of profits and must not, therefore, be included in the cost accounts.

DRAUGHTING—EXPENSE OF. The basis of distributing the expense incurred in connection with draughting will

depend upon the total amount involved. With the small concern and in all cases where the amount of this item is not large, the total may be apportioned over the factory and selling expenses, according to the extent it is estimated each benefits by the work of this department. If the drawing office is only engaged upon the sketching of drawings for the factory, the total amount should then be charged to factory expenses.

With large concerns it may be desirable to provide the means of obtaining direct allocation of this expense item, and in such cases a method of booking time to the respective jobs should be introduced. Draughtsmen engaged on special work may book their time to the job number concerned, and ordinary routine work to a service order number. By this means the amount of time spent in preparing drawings for the factory will be ascertained, as also time relative to drawings for estimating for the Sales Department, etc.

The total expenses of the drawing office, which will include all drawing materials, etc., in addition to salaries, must be ascertained and a rate per hour calculated.

DRAWING OFFICE EXPENSE. (See DRAUGHTING—EXPENSE OF.)

ELEMENTS OF COST. A "cost" is the sum of three groups of components or elements, viz., the purchase price of materials, the cost of the hire of labour, and the value of other disbursements made or expenditure incurred in achieving the desired product or result. The elements of cost are, therefore, classified into three main groups and are known as—

1. Labour.
2. Materials.
3. Expenses.

The further analysis of the three elements of cost are grouped under two main headings, namely—

- | | |
|--------------------|----------------------|
| (a) Direct Labour. | (b) Indirect Labour. |
| „ Materials. | „ Materials. |
| „ Expenses. | „ Expenses. |

The sum total of group (b) comprises the Establishment Expense of a business. The elements of cost are again grouped into prime cost, factory or manufacturing cost and selling and distribution costs, and for this purpose the total of group (b) is allocated or apportioned over the manufacturing, selling and administrative sections of the business. (See CLASSIFICATION OF COST.)

EMERSON EFFICIENCY BONUS INCENTIVE PLAN. By this method the daily rate is guaranteed. It is calculated by adding to the standard time 20 per cent of the time taken, and multiplying by the hourly rate, and starts at 66·6 per cent of normal output.

Its principal disadvantage is that there is no special incentive at the point of standard production, and that workers other than the ambitious are inclined to fall back on the guaranteed rate.

It is a very mild form of incentive payment and could well be used as an intermediate step to the more advanced systems. It is specially good in the attention it pays to the time saved. The cost per piece produced is comparatively low, but, as with all systems in which the daily rate is guaranteed, the expectation of low cost is not always realized.

EMPLOYEES—RECORD OF. A complete record of each worker's name and address, age, previous experience, the rate at which he is to be paid, etc., which is prepared at the time of the engagement.

The method of engaging labour will naturally differ according to the nature and size of the business. With small concerns the owner-manager will usually engage a worker as and when the necessity arises, but with larger factories this function is usually performed by a foreman or works manager, whereas in other cases there will usually be an Employment Department, whose chief duty is to ensure that a regular supply of the right type of labour is always available.

With the small concern a detailed record of the workers engaged may not be required beyond the usual wages book, but when a large number of workers are employed a proper record is necessary on account of the many changes that take place each week, both in regard to rates of pay and new workers. The record of employees for the smaller or medium-sized concern need not be so elaborate as that required by the larger concerns. In the one case a record either on an 8 in. by 5 in. card or loose sheet will meet all requirements, whereas with others, and especially with large factories, it will be necessary, on the engagement of a worker, to notify the respective departments in advance, because provision must be made for recording times and earnings, the payment of wages, and also for the allocation of work.

In such cases the record of employees will usually be arranged on the card system, the cards being ruled similar

to the specimen given. The main part of the specimen form serves as the permanent record and the two slips are detached, the one being handed to the worker at the time of his engagement, and the slip headed "Planning Department" sent to that department, so that the necessary arrangements can be made in advance for the allocation of work.

The main part of the form, which is a card 8 in. by 5 in., may either be retained by the Employment Department, or if such a department does not exist, it should be kept by the wages section of the Cost Department. Assuming the latter to be the case, the wages section upon receipt of the employment form will prepare a gate card and send it to the gatekeeper, so that it will be available on the day the new worker commences. Upon the arrival of the worker at the factory, he hands his engagement slip to the gatekeeper, who then conducts him to the card racks, points out the position of his gate card, and instructs the worker how to register his time. The worker is then handed over to his foreman.

The employee's record card, retained by the wages section of the Cost Department, may be filed alphabetically under the name of the worker or numerically by clock number. Whichever method is chosen, it is usually found more convenient if the cards are firstly filed according to departments, and, secondly, by name or clock number. Whenever a worker is transferred from one department to another, the use of a card record method enables the worker's card to be easily removed and placed amongst those relating to his new department. Likewise as and when a worker leaves the services of the company, his record card can be removed and filed separately amongst the cards relating to other workers who have left the employ of the company.

On the reverse side of the record card is noted particulars of any character given by the worker's previous employer, also details relating to National Insurance cards, etc.

When the employee's record card is retained by the Cost Department, it is desirable that sufficient space be given for recording any changes in rates of pay, as they may be used as the medium for preparing the gate cards each week and in checking the rates of pay when calculating the amount of bonus or wages earned from the various job cards or work tickets.

On the other hand, if the record card is kept by the Employment Department, it may not be necessary to record the changes of rates thereon, as such information may be

Form No. 45.

EMPLOYEES RECORD CARD									
<u>ENGAGEMENT NOTICE</u> <u>AND</u> <u>WORKS ADMISSION</u> <u>TICKET</u>			<u>ENGAGEMENT NOTICE</u> <u>TO</u> <u>PLANNING DEPT</u>			NAME _____ IF MARRIED _____ ADDRESS _____ DATE OF BIRTH _____		CLOCK NUMBER _____	
NAME _____ CLOCK NO. _____ DEPT. _____ TRADE _____ RATE _____ DATE TO START _____ TIME " " _____ SIGNED _____		DATE TO START _____ TIME TO START _____ DATE STARTED _____ DEPARTMENT _____ TRADE _____		DATE TO START _____ TIME TO START _____ DATE STARTED _____ DEPARTMENT _____ TRADE _____		DATE TO START _____ TIME TO START _____ DATE STARTED _____ DEPARTMENT _____ TRADE _____		DATE TO START _____ TIME TO START _____ DATE STARTED _____ DEPARTMENT _____ TRADE _____	
INCREASES									
RATE TO START PER HOUR		NEW HOURLY RATE		NEW HOURLY RATE		NEW HOURLY RATE		NEW HOURLY RATE	
DATE		AUTHORISED BY		AUTHORISED BY		AUTHORISED BY		AUTHORISED BY	
REMARKS.									
REASON FOR DISCHARGE PER DISCHARGE NOTE NO. _____									
DATE OF DISCHARGE _____									

BRING THIS TICKET WITH
YOU WHEN COMMENCING
WORK

THE MANUFACTURING CO.
LONDON

more suitably recorded on rate cards kept by the Planning, Rate Fixing, Costing, or other department.

EMPLOYEE'S WEEKLY PAY—RECORD OF. A record of the gross amount of weekly wages earned by each worker.

As income tax is deducted weekly from each worker's pay it is necessary for all firms to make a return showing the total earnings of all employees together with the amount of tax deducted. In addition to the records required for income tax purposes a record card similar to the illustration on page 154 is sometimes used. A separate card is made out for each worker, and the gross earnings entered each week either direct from the gate cards or the pay roll.

The record cards are usually ruled to accommodate the thirteen weeks for each quarter in column form, and as both sides of the card can be ruled alike, they may remain in use for a period of two years.

The record of weekly pay can be put to many useful purposes in addition to that required for the income tax return. An examination of the cards, for instance, will immediately show whether a worker is maintaining his average weekly pay, and in those cases where the record shows a variation in the amount paid each week, the cause can easily be ascertained either by reference to the record of bonus or piece work earnings, or to the record of lost time or absentees. The many uses of the employee's weekly pay record, however, will depend upon the amount of statistics obtained and recorded by the costing system. (See also PAY ROLL.)

EMPLOYERS' LIABILITY INSURANCE. The amount of the annual premiums payable in regard to Common Law, Employers' Liability Act and Industrial Injuries Act, is an item of establishment expense and is analysed to Factory, Selling, and Administrative Departments.

The analysis of this item is simple, as the premium is assessed on the amount of wages and salaries paid in the respective departments, according to the nature of the "trades" of the respective workers and, in regard to the clerical staff, the amount of salary paid to all employees earning up to a maximum amount per annum.

ERRORS—COST OF. (See DEFECTIVE WORK—COST OF.)

ESTABLISHMENT EXPENSE CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

ESTABLISHMENT EXPENSE. The total expense incurred in running the business both of the factory and offices, etc., which cannot be directly chargeable to any one

EMPLOYEE'S WEEKLY PAY RECORD.

Employee's Name Check No.
 Address Department
 Trade

FIRST QUARTER.				SECOND QUARTER.				THIRD QUARTER.				FOURTH QUARTER.			
Week Ending	£	s.	d.	Week Ending	£	s.	d.	Week Ending	£	s.	d.	Week Ending	£	s.	d.
1				14				27				40			
2				15				28				41			
3				16				29				42			
4				17				30				43			
5				18				31				44			
6				19				32				45			
7				20				33				46			
8				21				34				47			
9				22				35				48			
10				23				36				49			
11				24				37				50			
12				25				38				51			
13				26				39				52			
TOTAL 1ST QUARTER	£			TOTAL 2ND QUARTER	£			TOTAL 3RD QUARTER	£			TOTAL 4TH QUARTER	£		

Card No. Total for Year Ending 19 £

product or process, but only apportioned according to some chosen method.

Establishment expense comprises such items as rent, rates, taxes, postages, telephones, telegrams, salaries, repairs and maintenance of buildings, plant and machinery, indirect labour, indirect materials, depreciation, legal expenses, sundry office and works expenses, etc.

The establishment expense of a business is of two kinds, viz., constant and variable.

Constant Expenses are those which do not vary directly with the volume of output or trade, such as rent, rates and taxes, fire insurance, depreciation of buildings, directors' fees, etc. ; and

Variable Expenses are the indirect expenses which fluctuate with the volume of output or amount of work done, and include such items as indirect labour, indirect materials, power, light and heat, repairs and maintenance, charges for water, sundry works expenses, works clerical assistance, salaries, commissions on sales and output, stationery, etc.

No feature of cost accounting is more difficult than the treatment of establishment expenses, and this item has received the least attention on account of the general and erroneous impression of its extremely elusive nature. If these expenses are dealt with in a correct manner, very great possibilities of savings are presented, as they can be calculated and scientifically controlled with a surprising degree of accuracy.

The correct treatment of this subject in most systems of cost accountancy will require that the total establishment expense be subdivided, so that it can be dealt with in three or more groups, viz —

- (1) Factory expense.
- (2) Selling and distribution expense.
- (3) Administrative expense.

This grouping of expenses is necessary, as by their division the correct proportion of all the indirect items can be charged to the respective departments, products or processes, and the actual cost of the Sales and Administrative Departments ascertained separately from the factory (or works) cost.

The work entailed in the treatment of this subject in a costing system will require to be done in the following stages—

- (a) **Collection**, which refers to the collection and transfer

of expenses from the financial or suspense accounts to the cost accounts.

(b) **Allocation**, which is the work of analysing each item of expense under its respective group (1), (2), and (3), as mentioned above.

(c) **Computation and Recovery**, which refers to the method by which the expense rate is calculated and recovered in the individual cost accounts.

For a detailed consideration as to the items which are chargeable to the factory, selling, and administrative groups, also the various methods of collecting, allocating, and recovering expenses in costs, see under their respective headings. The principles which govern the apportionment of each item of expense are dealt with under the title of the expense item.

Owing to the special nature of the items which comprise the establishment expense of a business, they are generally dealt with by estimating the total for the year, and at frequent periods this estimate is checked by comparing the amount of expenses recovered in costs with the actual expenditure incurred. The necessity for this predetermination of expenses is due to the fact that facilities are used before the amount of the expense so incurred is known, and appears in the accounts as a liability.

The principles upon which estimates of expenses are generally prepared may be considered under three headings—

(1) By using the total expenses as shown in the Trading and Profit and Loss Accounts of the previous year.

(2) By estimating all expenses according to a reduced amount of business it is expected will be done during periods of trade depression.

(3) By basing the estimate of expenses on the full normal output capacity of the factory.

(i) **Using the Figures of Previous Accounts.** Estimating expenses by this method is extremely simple. For the very small workshop it will generally provide a fairly close estimate, as expenses are usually constant throughout the year. Variations in volume of output do not affect expenses in these cases to the same extent as with larger concerns, as the size of the shop and the small number of machine tools, etc., available will not permit of sufficient increase to materially affect expenses.

In the case of larger concerns, however, this method of estimating expenses will not provide a reliable estimate, as variations in trade or factory output will materially affect

the total expenses to a far greater degree than would be the case with small workshops.

With the small workshop, therefore, and in certain cases where a seasonal trade is done, and when it is proved by previous records that the output, sales, and expenses over a period are fairly constant, this method may be adopted with fairly good results.

(2) **Estimates Based on Reduced Output.** The basing of expenses on an estimated reduced output is a method used when it is considered that all expenses must be recovered in costs irrespective of the amount of trade done; for instance, during periods of trade depression, many concerns will assume that the total business they hope to secure may not be sufficient to keep their factory working at full normal capacity, i.e. full ordinary time, consequently their expenses must be fully recovered in costs by being spread over this reduced output.

When estimating the expenses under this method, it must be borne in mind that if it is assumed that the factory will only be working, say, three-quarter time, it does not necessarily follow that the expenses will be reduced in the same proportion; for instance, the "constant" expenses will not vary with the volume of output, therefore those items which comprise the "variable" expenses will only need consideration.

OBJECTIONS TO REDUCED OUTPUT METHOD. It is well to note that whilst all the expenditure incurred for a financial period will be charged against the total revenue obtained from sales, etc., in the ordinary financial accounts during that period, the treatment of establishment expenses in costs will require consideration from different aspects to that of purely financial accountancy.

The recovery of expenses in costs does not necessarily imply that *all* the expense must be recovered in the cost of goods produced for sale, but rather that the working of the costing system should show how and why the expense was incurred, and it is only by segregating all the unremunerative expenses, waste, and other losses from those expenses that have been legitimately incurred by actual production that the question of expense control can be correctly dealt with.

The recovery of expenses by the above method has, therefore, many disadvantages, and the chief ones may be stated as follows—

EFFECT ON PRODUCTION COSTS. One of the advantages that should be derived from a good system of costing is the

ability to compare the expenses against the volume of production of one period with another, in order to ascertain whether production efficiency is being maintained, increased or decreased, whichever the case may be, and the general effect upon the cost returns will be that during periods of active production the costs of individual items will appear low, as expense rates will be based upon the full output capacity of the factory, whereas during periods of slack trade costs appear high, as expenses will then be recovered upon a less volume of production. Thus a varying output, which is beyond the control of the factory executives and workers, is allowed to affect the cost of work done by them.

When the factor of varying production is allowed to influence the amount of establishment expenses recovered in costs, it will easily be seen that it destroys the value of the cost records, and completely eliminates the possibility of comparison as it is almost a general fact that during periods of trade depression a factory is usually run more economically, comparatively speaking. The supervision of workers becomes more strict, with the result that operations performed or work done will be of a better quality, and generally completed in less time than when the factory is fully manned and supplied with more orders than it can comfortably complete whilst running full time.

COMPARISONS OF COSTS SPOILT. Comparisons of detail costs of an article or operation cannot be properly made if there are not taken into consideration all the three elements which have entered into its cost of production, and it will therefore be seen that if the factor of varying production is allowed to affect the factory cost of an article or operation simply by increasing or decreasing expense rates according to the volume of output, the question of comparison of costs becomes one that will mislead rather than assist the executives of a business.

An example will assist to further explain this particular point. In an engineering factory the machine shop will always provide instances where a variable output will appear to affect costs of production, despite the fact that the same time and the same quantity of materials are used for a particular article. The actual method by which factory expenses are recovered will not affect the position, as the result will be the same in each case, therefore for the purpose of illustration it is assumed that a machine rate is used and that the expenses, etc., are as follows.

MILLING DEPARTMENT

Total Expenses	£5,000
Total Machine Hours when working two-thirds ordinary time	40,000
Machine Hour Rate	2/6 per hr
INDIVIDUAL COST—	£ s. d.
W.O. 4567. Labour	50 — —
Materials.	45 — —
	£95 — —
Machine Rate, 520 hrs. at 2/6	65 — —
	£160 — —

The same cost during a period of active production would be—

Total Expenses	£5,000
Machine Hours	60,000
Machine Rate	1/8 per hr.
SAME INDIVIDUAL COST—	£ s. d.
W.O. 4567. Labour	50 — —
Materials.	45 — —
	£95 — —
Machine Rate, 520 hrs. at 1/8	43 6 8
	£138 6 8

The above illustration is sufficient to show that attempts at comparison of costs under the circumstances stated will not only be valueless, but the effect upon the future policy of a business may be such as will render it exceedingly difficult to obtain business.

LOSSES DIRECTLY DUE TO SHORT TIME NOT KNOWN. During periods of slack trade the actual losses which are directly due to the plant working short time will not be known, as the expense which is actually incurred by *working* plant is not separated from those expenses chargeable to *idle* plant.

The extent to which individual and total costs may be influenced by this cause is clearly indicated by the above example, and is sufficient to show that if manufacturing efficiency is to be accurately measured and compared with previous performances, the method provided must be such as will eliminate the factor of varying production from individual costs, so that "unearned" or "unabsorbed" expenses are not allowed to disguise the real facts. Expenses that are not chargeable or unabsorbed by current production

represent the expense of maintaining idle plant, and are more directly regarded as a charge to profit and loss and not to production.

It follows from the above that if selling prices are based upon costs, tenders will be too high during slack periods and trade lost, whereas during periods of active production tenders will be low and at a time when better prices should be obtained owing to sufficiency of work.

(3) **Basing Estimates on the Full Normal Output Capacity.** The estimating of expenses upon the full normal capacity has many points of superiority over methods (1) and (2) above. This method has the double advantage in that it not only enables correct costs to be obtained, but that once the true import of idle plant or unabsorbed expense is understood, it provides valuable information upon which the management is able to formulate a more comprehensive policy regarding manufacturing and selling, than is generally the case with the other methods.

Predetermining Expenses. The predetermination of expenses for the ensuing period will be based upon the reduced or full normal output capacity of the factory, according to which of the above methods is used, and a close estimate can only be arrived at when all the factors which enter into the estimate are dealt with individually and upon a scientific basis.

The procedure to be followed in this direction will be very similar to that given for estimating output, etc., and as given in the description of the various methods of recovering expenses in costs, such as the percentage on direct wages method, etc. The basis of allocating each item of expense depends upon circumstances, and details and examples of these are given under the title of the individual items.

The detailed work involved in estimating expenses is very similar to that which is used when collecting and allocating, etc., the *actual* expenses each month or other period for the purpose of checking the estimated rates, the only difference, therefore, being that in this instance one will estimate the amount of each expense item, whereas in the other case mentioned the actual expenditure for the period is collected and allocated.

In dealing with the estimate, therefore, the items should firstly be entered upon an "expense allocation statement," and the amounts then allocated to sub-accounts in accordance with the general principles outlined under that heading, and,

lastly, the expense rate ascertained so that expenses can be recovered in costs upon this basis.

ESTIMATED COST. (See COST ESTIMATING.)

ESTIMATING DEPARTMENT—EXPENSES OF. The total expenses of maintaining an Estimating Department, which will include salaries, stationery, and the like, will form part of the establishment expense of a business. The allocation of the amount depends upon whether the Estimating Department serves both the Factory and Selling Departments or the one section only.

In many cases the work of estimating, etc., will be carried out by an individual or department attached either to the Cost Department or Sales Department. If the former, the expense may conveniently be dealt with in the accounts of the Cost Department, but if the latter, the amount will be automatically allocated to selling expenses.

With some concerns, however, a separate Estimating Department will be maintained and the expense is then apportioned to the Factory and Selling Expense Accounts, according to the extent each benefits from the activities of the department.

ESTIMATING INDIRECT EXPENSES. (See ESTABLISHMENT EXPENSE.)

EXPENSE ADJUSTMENT ACCOUNTS. (See COST CONTROL ACCOUNTS; also COLLECTION OF EXPENSES.)

EXPENSE ALLOCATION STATEMENT. A statement showing how establishment expense are debited to each department of a business. For an illustration of form see ALLOCATION OF EXPENSES.

EXPENSE ANALYSIS SCHEDULE. (See COLLECTION, also ALLOCATION OF EXPENSES.)

EXPENSE APPORTIONMENT. (See ALLOCATION OF EXPENSES.)

EXPENSE CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

EXPENSE DEPARTMENTS. (See SERVICE DEPARTMENTS.)

EXPENSE, ESTABLISHMENT. (See ESTABLISHMENT EXPENSE.)

EXPENSE MATERIALS. A term that is sometimes used when referring to those materials that cannot be easily measured and charged direct to an article, order or process, but only apportioned according to some logical method.

Expense materials may, therefore, include sundry items for the maintenance of plant, machinery, and buildings, such as

lubricating oil, belting, cotton waste, grease, and spare parts used in repairing the machinery, fuel, petrol, packing materials, solder, Fluxite, emery paper, chalk for polishing, small perishable tools, and all such items used in manufacturing.

In some instances the term "expense material" may only be used in connection with those items which solely relate to the repair and maintenance of plant, and also as required by the various service departments, such as spare parts for machines, cutting and lubricating oils, paint, and the like for repairs to buildings, fuel for heating, etc., petrol, etc. The remaining items of this class of materials, i.e. chalk for polishing, flux for soldering, solder and the like as used by most engineering firms, and ink, etc., by printers, etc., are then classified as indirect materials. A distinction in this case is made between those sundry materials that are directly used in production, and which it will be noted cannot be directly allocated to individual jobs, processes or operations, and those items that may be termed expense or maintenance materials.

The necessity for this subdivision will only arise with very large concerns, and where the expenditure in regard to this class of material is exceptionally large. (See also MATERIALS—CLASSIFICATION OF.)

EXPENSE ORDER. (See SERVICE ORDERS.)

EXPENSE RATE. The established measure used for ascertaining the proportion of expense that is to be charged to a particular process, operation, article or order. The measure used may be a percentage rate or a rate per unit, such as per article, per hour, per pound, etc.

The method of arriving at a rate will be determined by the basis upon which the establishment expense is recovered in costs, and which may be one or a combination of the following—

1. Percentage on direct labour.
2. Percentage on prime cost.
3. Departmental rate.
4. Direct labour hour rate.
5. Machine rate.
6. As a rate per article dispatched and invoiced to customers.
7. As a percentage on the works cost of goods dispatched to customers.
8. As a percentage on the sales value of goods dispatched to customers.

Nos. 1 to 5 inclusive relate to the principal methods used for recovering factory expenses in costs, and Nos. 6 to 8 inclusive to the recovery of selling expenses

EXPENSE SUMMARIES. (See COLLECTION, ALLOCATION, also COMPUTATION OF EXPENSES.)

EXPENSE SUSPENSE ACCOUNTS. (See COST CONTROL ACCOUNTS and COLLECTION OF EXPENSES.)

EXPENSES. The expenses of a business are divided into two main groups, that is—

1. Expenses that have been specially incurred for specific orders and can, therefore, be charged direct to the specific job, operation or process.

2. Those expenses which have been incurred in the general running of a business, and which can only be dealt with as a general charge over the whole business.

The former are known as direct expenses and the latter as indirect expenses.

Direct expenses comprise such items as the cost of any assistance or facilities used for a special order or process, i.e. portable cranes or special machinery may be hired for a particular job, special travelling and other expenses incurred or heavy items of carriage on materials or parts, special draughting, etc., and all other items which are capable of being charged direct to the order.

Indirect expenses will comprise postages, stationery, telephones, rates and taxes, clerical assistance, depreciation, and all cash disbursements and book charges which cannot be directly chargeable to any one process or order. Indirect expenses, together with the indirect labour and indirect materials, constitute the establishment expense of a business. (See ESTABLISHMENT EXPENSE.)

EXPENSES—ALLOCATION OF. (See ALLOCATION OF EXPENSES.)

EXPENSES—CLASSIFICATION OF. The expenses incurred in any factory or works comprise one part of the three elements that together form the factory cost of a manufactured article. These expenses are generally found to be so numerous that correct classification in some definite form is absolutely necessary.

It is not uncommon to find in highly organized factories, in addition to the ordinary working expenses, that large sums of money are spent on the latest types of machinery and labour-saving methods, research and experimental work, well-fare and recreation facilities for workpeople, etc., and the total sum involved for expenses may, therefore, easily be double or treble that of the total labour cost.

The classification of expenses will obviously differ with each

factory, and no general form can be given that will be suitable under many conditions, but to explain the general principles underlying this subject the classification will be considered under the following main headings—

1. Labour (indirect).
2. Materials (indirect).
3. Administration expense,
4. Power expense.
5. Plant expense.
6. Building expense.
7. Miscellaneous expense.
8. Insurance.
9. Rent, rates, taxes.
10. Depreciation.
11. Fees, charges, etc.
12. Selling and distribution expense.

1. Indirect Labour. Refers to any work carried out in an indirect manner by way of manufacture, such as handling raw material into the various production shops, inspection and viewing, supervision, etc.

2. Indirect Materials. In addition to the main manufacturing materials known as direct materials, a variety of other materials are generally required in any factory to help complete the many processes carried out in manufacturing. These do not, however, form part of the actual finished products and are, therefore, classified as “indirect materials.” Take, for example, cleaning materials, oil, grease, cotton waste, etc.

3. Administration. Administration expense will be found to vary in accordance with class and size of any factory. In a reasonably large works the departments covered by this classification would be—

- (1) General works office—including works manager and staff—Wages office, planning, progress.
- (2) Cost and estimating.
- (3) Drawing.
- (4) Stores and goods inwards.
- (5) Laboratory and research.
- (6) Welfare and canteen.

Wages, salaries, and *all* expenditure in any, or all, of these departments would come under the heading of “administration expense.”

4. Power. There may be several kinds of power, such as

"electricity," "steam," "hydraulic," etc. Under this heading would be included all wages paid to mechanics and electricians, etc., employed in the generating station, boiler attendants and stokers in the boiler house, and the like, also all expenditure for coal, fuel, oil, water, repairs to plant or buildings, insurance, depreciation, etc., and items expended in the course of lighting and heating the factory, or any department connected with the works, etc.

5. Plant. Plant expense includes all items of expenditure on repairs and renewals throughout the works, administrative offices, etc.

6. Building. Building expense includes all items of expenditure on repairs to the various buildings throughout the works, including all administrative and commercial departments.

7. Miscellaneous. Miscellaneous expenses are those which cannot conveniently be classified under any of the main headings and are, therefore, referred to as "unclassified expenses." Such expenses may occur in any manufacturing shop or administrative department.

8. Insurance. Most factories, large or small, generally take precaution by covering the value of the works against the risk of fire. All moneys paid in respect of premiums would come under this heading.

9. Rent, Rates and Taxes. These items of expense occur in all factories. The method of apportionment to the various departments is considered under the heading of "Allocation of Expenses."

10. Depreciation. All plant and buildings throughout the works decrease or depreciate in value year by year, and, therefore, a certain sum has to be accounted for to cover the value of depreciation, thus forming an expense termed "depreciation."

11. Fees, Charges, etc. Under this heading would be directors' fees, legal charges, audit fees, and any other professional expenses that might be incurred.

12. Selling and Distribution. Will comprise all expenditure incurred in the sale and distribution of the finished article. Any item entering into the cost of manufacture would be excluded. The items falling under this heading would be: Salaries paid to sales manager and his staff, advertising, catalogues, literature, etc., commissions to agents, travelling expenses of Sales Department, discounts allowed, stationery, and also a proportion of such items as rent, rates, taxes, depreciation, heating, lighting, etc.

Constant and Variable Expenses. The nature of the various expenses may be said to be of two kinds, viz., "constant" and "variable," and a further analysis of the above classification under these two classes will give the following result—

<i>Constant</i>	<i>Variable</i>
(a) Insurance.	(e) Indirect labour.
(b) Rent, rates and taxes.	(f) Indirect materials.
(c) Depreciation—	(g) Administration
Plant.	(h) Power.
Buildings.	(i) Plant.
(d) Fees and charges.	(j) Building.
	(k) Miscellaneous.
	(l) Selling and distribution.

"Constant expenses" are those which do not vary directly with the volume of output or trade. "Variable expenses" are represented in the sum expended on all indirect expenses incurred in the working of a factory, and these will be found to vary or fluctuate with the volume of output or amount of work done in any given period. The distinction is, therefore, quite obvious, and it is a general practice to deal with expenses under these two headings. The former are what might be termed predetermined expenses, having to be met whether the factory is working or not. The latter are those which are made or occur during the process of manufacture, and as such will vary according to the "services" rendered.

Form No. 47 shows at a glance the general classification of expenses and method of allocation to the various "service" and "production" departments—

The classification of expenses in the financial accounts presents little or no difficulty, for they are generally analysed at the time of posting invoices in the Expenses Journal. These totals are collected and carried into a General Ledger under such accounts as "Repairs and Renewals Plant," "Repairs and Renewals Buildings," "Factory Expenses Power," "Factory Expenses General," "Rent, Rates and Taxes," "Depreciation Plant," etc., the system being regulated by the general requirements obtaining in each particular business. Their collection from the financial accounts and recovery in the cost accounts demand careful and more elaborated analysis. In order to obtain the records under the various columns shown across the table above, it is evident that strict departmentalization of the factory is

EXPENSES (Table Showing General Classification)

Service Order Ref.	NATURE OF EXPENSE.	SERVICE.														PRODUCTION DEPARTMENTS.					Final Total.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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necessary and a system of routine in operation, whereby the details may be easily collected and worked out. Recovery of expenses in the various "service" departments will present certain difficulties, and the cost accountant will frequently be confronted with many problems. Much, however, depends on the simplicity, or otherwise, of the system in operation. These remarks also apply in connection with the recovery of service departments' expenses in the various manufacturing or production shops.

The classification of expenses and their collection are further dealt with under the heading of "Service Orders." (See also CLASSIFICATION OF ACCOUNTS and CLASSIFICATION OF COST.)

EXPENSES—COLLECTION OF. (See COLLECTION OF EXPENSES, also COST CONTROL ACCOUNT, EXPENSE SECTION.)

EXPENSES DIRECT. (See DIRECT EXPENSES.)

EXPENSES INDIRECT. (See INDIRECT EXPENSES.)

EXPENSES—SELLING AND DISTRIBUTION. (See SELLING AND DISTRIBUTION EXPENSE.)

EXPENSES—UNABSORBED. (See UNABSORBED EXPENSES.)

EXPERIMENTAL AND DEVELOPMENT EXPENSES. The expense in connection with experimental and development work may be divided into two general headings—

1. Experimental work which has reference to the development or improvement of a company's standard or stock lines.

2. Experimental work which will arise in connection with a customer's special order.

1. The experimental work which relates to the improvement, etc., of standard lines may again be divided so that the expense incurred by existing stock lines is shown separately from that incurred by entirely new lines. All labour, materials, and parts used on such work, together with a proportion of the establishment expense, should be charged to special service or standing works orders, so that the total amount spent in this direction is easily ascertained. Separate service orders may be allocated to the different kinds of products. The total expense is in some cases included among the factory expenses, but as the benefits derived from experimental work may accrue to the business as a whole, it is more correct to deal with the allocation of the item on this basis and spread the cost over the whole business. Such treatment, however, will depend upon the total expense involved.

The cost of development, if large, should be spread over a period of time.

2. The cost of experimental work which is carried out on behalf of a special customer's order should be charged or shown against the cost of the order in question or spread over a definite quantity of the goods if repeat orders will be forthcoming. (See also **SERVICE ORDERS**)

FACTORED GOODS CONTROL ACCOUNTS. (See **COST CONTROL ACCOUNTS**, also **STORES—FINANCIAL CONTROL OF.**)

FACTORY COST. The sum of all items of expenditure *incurred* in the manufacture or production of any commodity, i.e. prime cost (direct materials, direct labour, and direct charges), plus factory expenses.

FACTORY EXPENSE. A subdivision of establishment expense, comprising all the indirect expenses which are incurred in running the works, the cost of all direct labour employed, and the amount of indirect materials consumed in production.

Factory expenses include such items as the cost of repairing and keeping in good order all plant, machinery, and works premises, depreciation of plant, machinery and buildings, works travelling expenses, works stationery, salaries of works manager, works superintendents, and works clerical staff, petty cash items and other sundry works expenses, wages of foremen, charge hands, shop clerks, watchmen, caretakers, shop sweepers and cleaners, enginemen and boilermen, crane drivers, labourers, etc., also oil, waste, spoilt materials and other miscellaneous factory supplies; light, heat and power, charges for water, gas, and electricity used by the factory; proportion of rent, rates and taxes, cost of purchasing and handling materials, and a share of the expenses incurred in the general and financial administration of the business

The work entailed in the treatment of factory expenses will require to be done in the following stages—

(a) **Collection**, which refers to the collection and transfer of expenses from the financial accounts to the cost accounts.

(b) **Allocation**, which is the work of analysing each item of expense under its respective group.

(c) **Computation and Recovery**, which refers to the method by which the expense rate is calculated and recovered in the individual cost accounts.

The general principles relating to the treatment of factory

expense are very similar to those described for establishment expense, and as most of the important points are given under that heading, reference should be made thereto

There are a number of methods of recovering factory expenses in costs. No one method can be regarded as suitable under all conditions or even applicable to any one particular class of industry, as the nature of the product or goods and the conditions under which they are made will not be the only deciding factors. The size of the factory and the volume of production, etc., must to an equal extent also enter into any consideration of this subject.

The various methods principally used for recovering factory expenses are given below, and a detailed consideration of each method will be found under its respective heading—

1. Percentage on direct labour
2. Percentage on prime cost.
3. Departmental rate.
4. Direct labour hour rate.
5. Machine rate.

FACTORY EXPENSE ALLOCATION. (See ALLOCATION OF EXPENSES.)

FACTORY EXPENSE CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

FACTORY ORDER. (See PRODUCTION ORDER.)

FICKER WAGE INCENTIVE PLAN. A Method of Sharing Savings in Time and Expense. By this method the daily wage is guaranteed and it can be calculated either on a time basis or piece basis.

On the time basis it is calculated from the following formula—

$$R_1 \times H_1 + \frac{1}{2} (H_2 - H_1) (R_2 + R_1)$$

Where R_1 = hourly rate
 R_2 = machine rate
 H_1 = time taken
 H_2 = standard time.

On a piece basis the formula is—

$$N R + \frac{R_1}{2} (H - H_1)$$

Where N = number of pieces
 R = rate per piece
 R_1 = machine rate
 H = standard time
 H_1 = actual time taken.

Considerable clerical labour is required for this method,

and the calculations are too complex to be easily understood by operatives. As in some of the other systems, the incentive will only be attained by the ambitious. Inasmuch as there is a sharing both of the saving in time and indirect expense (oncost) it should be above suspicion on the part of employees.

It is somewhat more generous than a piece rate. It starts at 100 per cent output, but there is neither step nor bonus below standard. The cost per piece produced is low where employees are above the average, but under converse conditions it becomes high. (See also WAGE INCENTIVE.)

FINAL COST. (See TOTAL COST.)

FINAL COST SUMMARY. (See COST SUMMARIES.)

FINANCIAL CONTROL OF STOCKS. (See COST CONTROL ACCOUNTS, also STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.)

FINISHED STORES CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS, also STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.)

FIRE INSURANCE. The amount of premium paid in connection with insurance against fire is allocated direct to the Administrative, Selling, and Factory Expense Account.

Insurance of Buildings, etc. The premiums paid on fire insurance to cover buildings will be apportioned according to the space occupied by the respective departments.

Insurance on Plant and Machinery, etc. The premiums on fire policies covering plant and machinery are allocated on the basis of the total value of machinery in each of the factory departments, whereas the amount of premiums on power plant will require slightly different treatment if the company generates its own power. In such a case the amount of premium is charged to the Power Department, and is apportioned over the various kinds of power generated according to the value of the respective power plants.

With very large concerns the value of machine tools, plant, etc., may be analysed into various groups, in which case separate premiums may be shown for such items as patterns and dies, loose tools, etc. When these accounts are segregated in this manner, the amount of premium paid on patterns, dies, etc., may be charged to a separate account, which will also receive charges for depreciation, etc., and then allocated over the respective factory departments using the patterns; alternatively the amount may be charged direct to the foundry.

The actual method of allocation will, therefore, depend upon the size of the factory and the extent to which the factory expenses are classified.

Insurance of Stocks, etc. The premiums payable upon fire insurance policies, which cover stocks of materials and saleable goods, are chargeable as follows—

Premiums on stocks of raw materials and parts held for manufacturing purposes will be charged to Factory Expense Account or Material Expense Account, whereas the premiums on saleable stocks will be charged to Selling Expense Account.

In some businesses, however, the amount of fire insurance is regarded as a financial charge and allocated direct to administrative expenses.

FIXED EXPENSES. (See CONSTANT EXPENSES.)

FIXTURES AND FITTINGS. A term that is generally used when referring to benches, racks, bins, desks, etc. The fixtures and fittings of a business are usually analysed in the cost accounts under the headings of works fixtures and fittings and office fixtures and fittings, this analysis being necessary when a separate expense rate is used for recovering selling and factory expenses.

With large concerns the fixtures may be further analysed into permanent fixtures and loose fixtures. Permanent fixtures are, as their name implies, of a permanent character and usually form part of the main buildings, whereas loose fixtures will include all movable items, such as desks, tables, benches, when not forming part of main buildings or structure, etc.

The actual items that are covered by all of the above terms will vary in almost every case, as certain parts of the lighting system, for instance, will be classified as fixtures, e.g. lamp fittings, switches, wiring, arc lamps, rosettes, guards, extension cord and, in the case of transmission plant, will comprise pulleys, hangers, stringers, shafting, etc. Such items as these, however, are more correctly classified as permanent or loose lighting equipment, transmission equipment, etc.

FIXTURES AND FITTINGS—OFFICE. (See OFFICE FIXTURES AND FITTINGS.)

FIXTURES AND FITTINGS—OFFICE—DEPRECIATION OF. The amount of depreciation on office fixtures and fittings is a charge to the selling and administrative sections of the business, and the item may be either apportioned over these two departments arbitrarily or in cases where the values

of fixtures, etc., are recorded separately, the amount is allocated direct. (See also DEPRECIATION.)

FIXTURES AND FITTINGS—OFFICE—REPAIRS AND MAINTENANCE OF. The method used for ascertaining the amount of the expense of repairs and maintenance of office fittings will depend upon the size of the concern and the amount of work done. With the small business the expense can conveniently be allocated to an Office Repairs and Maintenance Account, or included with the cost of repairs, etc., to buildings. This account is then closed out at the end of each month or other period, and the amount apportioned to the Selling and Administrative Expense Accounts.

With large concerns, however, the cost of repairs will usually be heavy, and a system of service orders must be used in order that the amount of expense incurred by each department can be ascertained.

FIXTURES AND FITTINGS—WORKS. (See WORKS FIXTURES AND FITTINGS.)

FIXTURES AND FITTINGS—WORKS—DEPRECIATION OF. Depreciation of works fixtures and fittings is included among the factory expenses, and the amount allocated to the respective departments according to the value contained in each. With those concerns where the departmental method of recovering factory expenses is not used, this further allocation will not be necessary. (See also DEPRECIATION.)

FIXTURES AND FITTINGS—WORKS—REPAIRS AND MAINTENANCE OF. The cost of maintaining in good repair the fixtures and fittings of the factory is a charge to the factory expense. The actual method used for collecting the various expense items will depend upon the size of the factory and the amount of repairs done in a given period. With the small concern such expenses can conveniently be allocated either to a Fixtures and Fittings Repairs and Maintenance Account or included with the cost of repairs, etc., to buildings. The account is then closed out at the end of each month by transferring the balance to the Factory Expense Account or Depreciation Account in those cases where the rates for depreciation include an allowance for repairs.

The cost of repairs, etc., to fixtures and fittings will usually be heavy with large concerns, and a system of service orders must then be used so that this expense can be controlled and allocated to the respective departments. (See also REPAIRS AND MAINTENANCE.)

FLAT COST. (See PRIME COST.)

FLEXIBLE BUDGETS. (See BUDGETARY CONTROL and MANAGEMENT THROUGH ACCOUNTS.)

FLUCTUATING EXPENSES. (See VARIABLE EXPENSES.)

FREIGHT. (See CARRIAGE.)

FULL NORMAL OUTPUT CAPACITY—BASING EXPENSES ON. (See ESTABLISHMENT EXPENSE.)

GANTT TASK AND BONUS—WAGE INCENTIVE. By this method the daily rate is guaranteed. The basis of this method of payment in Mr. Gantt's own words is: "The employee is not told in a general way to do better, but has a definite standard set for him and is shown how to reach that standard for which he is awarded compensation in addition to his usual day's pay." He prefers to pay the bonus as extra time taken as a percentage of the time allowed, usually between 25 per cent and 50 per cent.

The basis of this, as in most of the modern systems, lies in the careful calculation of the standard.

The principal disadvantage is that only the most ambitious workmen try to earn the bonus, others falling back on the guaranteed daily rate. This can be offset by the use of the charts devised by Mr. Gantt.

It is, however, a tactful way of adopting what has been called the "step" incentive at the standard without any temporary loss in earnings.

The cost per piece produced is usually low, but higher than some other forms, because of the guaranteed daily rate. (See also WAGE INCENTIVE.)

GATE CARD. A card used for the mechanical recording of the time of arrival and departure of workers. The rulings of gate cards chiefly differ according to the type of time recorder used. With some types of recorders the time is printed in column form which allows an unlimited number of time bookings, but with others which register in fixed positions the number of printings is generally limited to eight each day, that is four "in" and "out."

With both the above types two coloured ribbons can be obtained, and enable all irregular times to be printed in red and regular times shown in blue or black.

A specimen of both forms of gate card is given on pages 176 and 177.

GATE CARDS—USE OF. The record of time spent in the factory which forms the primary basis of calculating the workers' pay each week is made quite separately from the

times spent on each task or order, and a mechanically printed record is necessary if absolute accuracy is desired. Time recorders will prevent disputes and establish confidence, as an employee can see his registration when made. The cards used by the men at the gates and known as gate cards are essentially a record of attendance, as all time wages are calculated therefrom. Each employee is provided with a gate card for each week, and the actual routine in connection therewith will vary with the number of workers and size of the factory ; for instance, with the smaller concern the time recorders and card racks will usually be placed in some convenient position in the factory, as the same time recorder may be used for booking time to jobs in addition to recording the attendance at the factory. In such cases there is usually provided four card racks, two of which will contain the gate cards and the remaining two the job cards. The two racks for the gate cards are placed one each side of the clock, and are known as the " in " and " out " racks

On entering the factory in the morning each worker takes his gate card from the first rack, inserts it in the time recorder, and registers his time by pressing a lever. On completing this operation the gate card is placed in the second rack. The former is the " out " rack and the latter the " in " rack.

On leaving the premises either at midday or evening, the worker takes his card out of the " in " rack, registers his time, and places it in the " out " rack so that it will be available when entering the factory the next morning.

At the end of the pay week the gate cards are collected and replaced with fresh cards for the ensuing week, which have been previously made out by the Wages Department. The number of hours each worker has attended the factory on each day is now ascertained and entered by the wages clerk in the columns provided. The summary at the foot of the card is next completed, and deductions for National Insurance, subscriptions to sports club, etc., made and the net amount ascertained.

Upon completion of this work the cards, which should be retained in order of check or clock number, are next entered in the pay roll in order to ascertain the total amount of wages payable for the week in question.

The above method will be found quite suitable for the smaller sized factory, but with very large concerns it will invariably be necessary that separate time recorders be used

No	NAME	DEPT				
238	C. GLEDHILL BROOK	9				
LOST	29 APRIL 1949	O'TIME				
H M		H M				
	<div>7-30 M 12-00 M 12-42 X 5-00 X</div> <div>7-30 W 12-00W 12-42 MW 5-00 MW</div> <div>7-30 F 12-00 F 12-42 n 5-00 n</div>	<div>7-30 Tu 12-00Tu 12-42 TuTu 5-00 Tu</div> <div>7-30 Th 12-00Th 12-42 ThTh 5-00 Th</div>				
	Hours	Qrs.	Rate	£	s.	d.
Standard	44					
Overtime—Ord						
" Extra						
Lost Time						
TOTAL			3/-	6	12	0
Deduct {	Nat. Ins	Pension	Inc. Tax			
{	4/11		5/1		10	0
A.M. Upright Letter P.M. Horizontal Letter	AMOUNT TO PAY £			6	2	0

No. <u>64</u>						
Name <u>J King</u>						
Week Ending <u>10 Jan</u> 19						
DAY	IN	OUT	IN	OUT	Total	
A. M. M	$\Sigma 7 58$	$\Sigma 12 30$			$8 \frac{1}{2}$	
P. M.	$\Sigma 1 29$	$\Sigma 5 31$				
A. M. T	$\Sigma 7 57$	$\Sigma 12 31$			$8 \frac{1}{2}$	
P. M.	$\Sigma 1 27$	$\Sigma 5 32$	$\Sigma 6 00$	$\Sigma 8 03$	2	
A. M. W	$\Sigma 7 58$	$\Sigma 12 30$			$8 \frac{1}{4}$	
P. M.	$\Sigma 1 30$	$\Sigma 5 15$				
A. M. T	$\Sigma 7 57$	$\Sigma 12 31$			$8 \frac{1}{2}$	
P. M.	$\Sigma 1 29$	$\Sigma 5 31$				
A. M. F	$\Sigma 8 10$	$\Sigma 12 31$			$8 \frac{1}{4}$	
P. M.	$\Sigma 1 30$	$\Sigma 5 31$				
A. M. S	$\Sigma 7 57$	$\Sigma 12 33$			$4 \frac{1}{2}$	
P. M.						
A. M. S						
U						
N						
P. M.						
Ordinary Time		Hours	Rate	£	s.	d.
		$46 \frac{1}{2}$	$1/6$	3	9	9
Overtime		2	$1/10 \frac{1}{2}$		3	9
Total		$48 \frac{1}{2}$		3	13	6

for registering the attendance at the factory. In such cases the clocks will be placed at or near the gates and in charge of the gatekeeper or chief time clerk, as it is usual that a method for supervising the men during the process of clocking "in" and "out" be instituted. There are two general methods of doing this; the first is to have locks affixed to each clock, and the gatekeeper to open the recorders for use at stated times and then to lock them up a few minutes after starting times.

Alternatively, locks may be fitted to the card racks which are locked between starting and finishing times to prevent their unauthorized use. In either case, however, the gatekeeper or time clerk must be present whilst the clocks are being used.

The procedure in regard to the "in" and "out" clockings will be similar to that described above for small factories, excepting that "in" and "out" card racks will contain only gate cards and will be arranged in a manner that will expedite the "clocking" process, as a greater number of men must now be dealt with in a short period of time.

GENERAL EXPENSES. (See ESTABLISHMENT EXPENSE.)

GENERAL MANAGER—SALARY OF. The salary paid to a general manager forms part of the establishment expenses of a business and the amount is allocated to the administrative expense. In some instances, however, a general manager may devote more time to one or more sections of a business, and in such cases the salary should be apportioned over the Factory, Selling, and Administrative Departments according to the amount of time it is estimated he gives to each section.

GENERAL SERVICES. (See SERVICE DEPARTMENTS.)

GENERAL WORKS RATE. A term sometimes used when one general expense rate is applied to recover the whole of the factory expenses in place of a separate rate for each department. Such a term is ambiguous, as it does not indicate any particular method of recovering expenses and should, therefore always be qualified in some special direction. (See COMPUTATION AND RECOVERY OF EXPENSES.)

GOODS RECEIVED BOOK. (See GOODS RECEIVED—RECORDS OF.)

GOODS RECEIVED—INSPECTION OF. With certain industries provision must be made for the inspection and test of certain goods or materials received from outside suppliers, in order to ascertain whether they comply with any specification previously notified to the buyer on the purchase requisition.

Inspection of materials should be carried out immediately upon receipt and before they are handed over to the storekeeper. With large concerns it may be desirable to attach to the Receiving Department a permanent staff of inspectors, and when such conditions prevail the system required will not present any great difficulty as the inspection and test can be carried out at the same time as the receiving clerk is unpacking. On the other hand, it may be more convenient for the inspection of those materials which must comply with any special conditions to be undertaken by the Works Inspection Department, or view room, leaving the storekeeper to inspect the remaining general stores items.

The occasion will sometimes arise when part of a consignment of goods must be rejected, and in such a case a rejection note, ruled similar to the illustration given on page 182, should be made out, stating the reason for rejection.

The distribution of rejection notes will depend upon the system in operation, also the number of departments concerned, and in view of this no definite routine can be given that will be suitable under all conditions. The general principle of the receipt and inspection of goods is, however, dealt with more fully under the heading of "Purchasing." (See also **GOODS RECEIVED—REJECTION OF.**)

GOODS RECEIVED—RECORD OF. Upon the receipt of any goods by a concern, it is essential that an accurate list be prepared, otherwise there can be no check against the supplier's invoice or the stores records.

It is the common practice with some firms to record particulars of all goods received in a book and which may be known as a "Goods Received Book," or, in cases where carbon copies are made for distribution to the departments concerned, a "Goods Received Sheet." A specimen ruling of such a record is given, with the description of the routine in regard to "purchasing." (See page 366.)

The objects and purposes of a goods received record may be briefly stated as follows—

(a) To provide a complete record of all goods and materials received

(b) To notify the storekeeper of the quantity of goods which will be charged to the Stores Account, and which must be ultimately accounted for.

(c) To provide a basis for checking the supplier's invoices.

(d) To notify all departments concerned of the receipt of goods in those cases where this is necessary.

With some concerns a Goods Received Book in duplicate will serve most requirements, as the one copy may be torn out of the book at the end of each day and passed to the buyer for checking invoices, and then be sent to the Cost Department for making the necessary entries on the stock record cards. This method has its advantages for those concerns who only receive a few consignments daily, but when a considerable number of deliveries are made each day, the delay that usually occurs in notifying the storekeeper or buyer of the receipt of goods or in the writing up of the stock records, detracts considerably from the advantages that the system may possess. The method generally used by large concerns, therefore, provides for the recording of each consignment of goods on a separate slip or note. This system has many advantages, and the small amount of extra stationery involved is negligible when compared with its efficiency.

The specimen forms which are illustrated on pages 367 and 368 are an example, and may be known as a "goods received note" or "inwards goods note." A detailed description of the use of such forms has been given under the general consideration of "Purchasing," to which reference should be made.

GOODS RECEIVED—REJECTION OF. With most industries certain of the materials and goods received from outside suppliers will require to be inspected or tested, in order to ascertain whether they comply with any specification previously notified to the buyer on the purchase requisition. When the whole or a part of a consignment must be rejected, a note of the defective goods may be made on the goods received record, when a separate slip is used for each consignment; alternatively, a rejection note must be made out. The rejection notes used in connection with inwards goods or "bought-out supplies" will follow a different routine to those issued for the rejection of goods made in the factory. With "bought-out supplies" the rejection will primarily concern the office departments, but if a Planning or Progress Department forms part of the factory organization, this must also be taken into consideration.

No definite routine can be given that will be suitable under all circumstances, and the undermentioned methods and specimen forms are furnished by way of illustration only. The specimen form of rejection note (Form No. 50), quotes at the top the words "Stores Inspection," as all goods received are examined by a member of the works inspection staff in the

receiving section of the stores. The rejection note is made out in triplicate and the copies distributed as follows—

1. The first copy is attached to the third copy of the inwards goods note (or goods received record) (see PURCHASING, page 370), when both forms are then sent by the storekeeper to the buyer.

2. The second copy is sent to the Planning Department.

3. Third copy remains in the book.

1. Upon receipt of the rejection note by the buyer (also third copy of the inwards goods note, which is the storekeeper's receipt for the balance), he is able to take suitable steps for the replacement of the defective goods, and obtain credit for the quantity in dispute before passing the supplier's invoice. It will be noted that at the bottom left-hand corner of the form space is provided for noting the date, etc., when the defective goods are returned either for credit or replacement.

2. The second copy, which is sent to the Planning Department, serves as a notification to that department that the goods have been rejected, and enables them to modify any planning of work on the materials in question, should this be necessary.

3. The third copy remains in the book and is retained by the inspectors as a permanent record.

The above brief description is sufficient to indicate the purpose that is served by the rejection note up to the point of advising the buyer, but the extent to which a rejection of "bought-out supplies" will affect the routine of the Costing Department will depend upon the manner in which the record of goods received is made out; for instance, it may be the practice for the storekeeper to state on his copy of the goods received record the actual quantity he has accepted and placed into stock and, providing there is some means of reconciling this quantity with that stated on the supplier's invoice, the stock record cards and stores control accounts should "agree." Such a method, however, will generally entail a considerable amount of clerical work, and the matter can be more easily dealt with by making use of the rejection note when posting the "receipt" on to the stock record card. With the method explained above the buyer's copy of the rejection note, which is received by him attached to the inwards goods note, is sent to the Cost Department, who enter on their stock record card the actual quantity received and signed for by the storekeeper.

For details relating to the rejection of goods made in the

<div>STORES INSPECTION</div> <div>B.O. Supplies</div> <div>.....19</div> <div>Supplier.....</div> <div>.....</div> <div>Order Ref.. Sent to.....</div>		
DESCRIPTION.		QUANTITY.
REJECTED FOR—		VIEWED BY
RETURNED.		
Date.	Advice No.	Sig.

factory, see **MANUFACTURED GOODS—REJECTION OF ; WORK TICKET ;** also **INSPECTION CERTIFICATE.**

GOODS RECEIVED SHEET. (See **GOODS RECEIVED—RECORD OF.**)

GOODWILL. The amount of goodwill written off in the financial accounts at the end of a trading period appears to present difficulties to many minds so far as the cost accounts are concerned. The “writing off” of goodwill is a profit and loss transaction, and the amount must not be included in the cost accounts

GROSS COST. (See **TOTAL COST.**)

GROUP CENTRES FOR EXPENSE ALLOCATION. A term often used when referring to the allocation of factory expenses to individual machines or groups of machines, rather than departments, when the machine rate method of recovering expenses is operated.

HALSEY PREMIUM WAGE INCENTIVE PLAN; ALSO KNOWN AS PREMIUM BONUS. The most important item for notice under this method is that the operator is guaranteed his daily rate of pay under any circumstances. In this it agrees with some other systems, but it is a fundamental departure from the older practices and along the right lines.

A standard time is set for the performance of the work to be done, and the operator is paid for a fixed percentage of the saving in time accomplished by him, usually $33\frac{1}{3}$ per cent or 50 per cent.

The fixing of the standard time is of the utmost importance, but the method of doing so varies within wide limits. Often the average time taken to do the work by day work is taken ; not infrequently the shortest time taken is used. More rarely a standard time in excess of the average is used ; this is done deliberately to encourage the operators. When this method is used for machine work, the setting up time of the machine must be included, e.g. —

	Hrs.	Min.
Setting up time	—	45
Operating allowance— 10 pieces \times 35 minutes	5	50
TOTAL	6	35

This method is advantageous where the rate-setting is of the usual order, as there is not much risk for the employer. Where it has been in operation it has been fairly successful, but there has been criticism that while satisfactory for work

on which it has been established, there is evidence that operators have manipulated day rate times in order to obtain a high standard time when the occasion arises to place the new work on a premium basis.

The most damaging criticism is that the standard times are indefinite and lax. For a fuller discussion of setting standards see RATESETTING.

The gains from the operator's point of view are the guarantee of day rate when unable to achieve the standard time, and the opportunity of extra earnings when saving in time is effected.

There is no doubt that this method leads to better relations between employer and worker and, while not ideal, it is a long step in the right direction. The effect on the reduction of cost per piece produced is not very dependable, and in practice the cost is much higher than might be expected. (See also WAGE INCENTIVE.)

HEAD OFFICE ONCOST. (See ESTABLISHMENT EXPENSE.)

HEATING PLANT—DEPRECIATION OF. (See DEPRECIATION, also PLANT—DEPRECIATION OF.)

HEATING PLANT—REPAIRS AND MAINTENANCE.

The cost of repairing and maintaining of the heating plant in good order is a charge to the Heating Expense Account, which is ultimately apportioned over the Office and Factory Departments' Expense Accounts on the basis of cubic area or per foot of radiation in each department.

In those cases where the heating plant is very small, the expense of repairs, etc., can more conveniently be charged to a general Repairs and Maintenance Account for buildings, and the cost distributed together with other building expense.

When the heating plant and the area to be heated are very large, the cost of repairs will be collected by means of a system of service orders, to which will be charged all labour materials and other charges. By this method it is possible to ascertain the cost for each department, but in general the expense of maintaining the apparatus in good order is best dealt with by collecting all repair charges into one account, and distributing it together with the cost of repairs to buildings.

The choice of any one method, however, will entirely depend upon the size of the heating apparatus, also buildings. (See also REPAIRS AND MAINTENANCE)

HOLLERITH ELECTRICAL TABULATING AND SORTING MACHINES. Dr. Hollerith, who invented his machines to deal with the United States census of 1890, was the pioneer of what is now widely known as the punched-card method of accounting.

It is recognized that costing and general accounting involve repetition of the same figure in various accounts, both in the posting and totalling processes, and the Hollerith solution to this problem is that facts are recorded by hand in the form of holes punched in significant positions on a card representing each transaction.

The standard card is $7\frac{3}{8}$ in. \times $3\frac{1}{4}$ in. and contains 80 columns. There is also available a half-size card containing 38 columns, referred to later under Junior Machines. There is no difference in the two types of card beyond the fact that the 80-column card contains nearly twice as much information as the 38-column. A specimen 80-column card is shown, Form No. 51, in which part of the information is automatically punched from pencil marks, a new feature known as "Mark Sensing."

Information is punched by one of several different types of Key Punch. There is an entirely hand-operated punch; an electrical model and a fully automatic model which feeds and ejects the cards, as illustrated on page 186, can also be obtained. For those cases where information is common to a number of cards there are the Duplicating Punch, the high-speed Gang Punch, and the Reproducing Punch.

The accuracy of the punching operation can be checked by passing the cards through the Verifying Punch.

After the punched cards have been checked, the Horizontal Sorter (Fig. 2) is capable of classifying them according to any predetermined groupings, e.g. by Job No., Operation No., Part No., Material No., etc. A "Group Selector" can be fitted to this machine enabling any group number to be selected at one operation up to a total capacity of 8 digits, all other cards remaining in their original order.

The final machine in the series is the Tabulator, the function of which is to sense the punched holes in the cards, total them on one or more of several counters and finally print these totals. In addition the machine is capable of listing every individual card simultaneously with the totalling process.

Another type of machine known as the Rolling Total Model (Fig. 3), will perform all the processes already described and in addition can be made to cross total by rolling figures from one counter to another.

Similarly subtraction can be done between one counter and another, so that by distributing, let us say, Debits to one counter and Credits to another, the machine is capable of showing Total Debits and Total Credits and the balance either Debit or Credit.

DICTIONARY OF COSTING



FIG. 2. HORIZONTAL SORTER

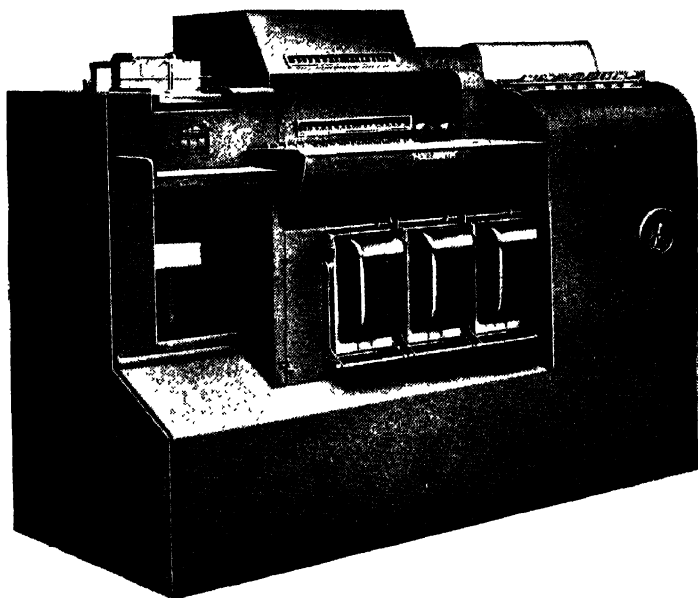


FIG. 3. ALPHABETICAL ROLLING TOTAL TABULATOR

mentioned the Multiplying Punch. In the past it has been necessary to introduce a calculating machine for the purpose, e.g. of working out a man's earnings say, six hours at 10d. per hour = 5s. With the Multiplying Punch all that is necessary is to punch into the card—six hours at 10d. per hour—and feed this into the Multiplier. The Punch will then complete the calculation and punch the product into the card in the appropriate space. It is capable of working either in decimals or in sterling currency. Its speed varies with the number of digits in the Multiplier.

Another interesting innovation is a series of Junior machines working on the Rolling Total principle, but using a half-sized card consisting of only 38 columns. Appropriate Punches and Sorting Machines are provided and the economies effected by the reductions in size and capacity have made it possible for smaller firms to take more advantage of the Hollerith method than has been possible in the past.

The Junior Tabulator embodies a novel form of ledger posting device.

A further innovation is the possibility of punching full alphabetical descriptions into the cards, and provision is made for 22 alphabetical columns.

Costs, Stores Control, Pay Roll preparation, Purchases, Sales, Budgetary Control, Ledgers, Statements, and Invoices are all well within the scope of this system.

HOURLY BURDEN. (See DIRECT LABOUR HOUR METHOD OF RECOVERING EXPENSES, or MACHINE RATE METHOD OF RECOVERING FACTORY EXPENSES.)

IDLE TIME. (See UNALLOCATED TIME.)

INCIDENTAL EXPENSES. (See ESTABLISHMENT EXPENSE.)

INCLUSIVE COST. (See TOTAL COST.)

INCOME TAX. The amount of tax paid by a business is an allocation of profits and is not, therefore, included in the cost accounts.

INCOMING GOODS—RECORD OF. (See GOODS RECEIVED —RECORD OF.)

INDIRECT CHARGES. (See INDIRECT EXPENSES.)

INDIRECT COSTS. (See INDIRECT EXPENSES.)

INDIRECT EXPENSES. Expenses other than indirect labour and indirect materials, but including cash disbursements and book charges which cannot be directly chargeable to any one process or product, but only apportioned according to some chosen method.

The term indirect expenses is sometimes used denote to all the indirect expenses of a business, i.e. establishment expenses. (See ESTABLISHMENT EXPENSE.)

INDIRECT LABOUR. Labour which cannot be directly measured or charged to a specific article, order or process, but which can only be apportioned according to some logical method.

The labour used by a manufacturing concern may be utilized in two ways: it may be employed in performing work directly upon a saleable article or product, or usefully employed in such work as sweeping the shop floor, attending to the issue of materials from stores, repairing the plant and machinery, or in supervising the workers of a department.

In the case of the former such labour is classified as "direct labour," and the latter as "indirect labour." With indirect labour it is not possible to charge it to any specific article or order on the basis of the actual work done towards its completion, although without such labour as this it is probable that the direct labour would not have been applied with equal efficiency.

INDIRECT MATERIALS. Such materials as cannot be easily measured and charged direct to an article, order or process, but only apportioned according to some logical method.

Indirect materials may, therefore, include sundry items used for the maintenance of the plant, machinery and buildings, such as belting, oil, grease, cotton waste, etc., also solder, Fluxite, emery paper, small perishable tools, chalk for polishing, and other items used in manufacturing. (See also EXPENSE MATERIALS.)

INDIRECT WAGES. (See INDIRECT LABOUR.)

INSPECTION CERTIFICATE. A note issued by the Inspection Department, or view room, certifying that the goods stated thereon have passed final inspection.

The use of such a form and the number of copies which will be issued will naturally differ with each concern, as the function of inspection will vary with the nature of the product and whether it is made in large or small quantities.

From a purely costing point of view the inspection certificate serves as a notification that certain work on the production order is finished, consequently no further time or materials should be booked against that order. With regard to the stores records, the certificate may also serve the purpose of an authority for the storekeeper to accept the goods into his

stock. In such a case the inspection certificate may form the medium for entering the stock record cards relating to the finished stores, and also as a guide to the Cost Department when crediting Work in Progress Account and debiting Finished Stores Control Account with the value of the item.

In the case of special goods which are not placed into *Form No. 52.*

SEND THIS TO STORES WITH GOODS	INSPECTION CERTIFICATE		DELIVERY NOTE NUMBER	
	No	2299	DATE	/ /
			WORKS	ORDER NUMBER
	The following Goods are certified ready for Despatch:			
SEND THIS TO PROGRESS DEPARTMENT	INSPECTION CERTIFICATE		DELIVERY NOTE NUMBER	
	No	2299	DATE	/ /
			WORKS	ORDER NUMBER
	The following Goods are certified ready for Despatch:			
TO	INSPECTION CERTIFICATE		DELIVERY NOTE NUMBER	
	No	2299	DATE	/ /
			WORKS	ORDER NUMBER
	The following Goods are certified ready for Despatch:			
		TO BE DTD TO		
		SIGN'D		

stock, the certificate may be the notification to the Sales Department that the goods named thereon are ready for dispatch.

A specimen set of inspection certificates is shown, which relate to a method of inspection for all goods which are placed in the finished stores, forms printed on a distinctive coloured paper being used for special items, and the top copy sent to the Sales Department. (See also MANUFACTURED GOODS—REJECTION OF; GOODS RECEIVED—REJECTION OF; and WORK TICKET.)

INSPECTION OF STORES. (See GOODS RECEIVED—INSPECTION OF.)

INSURANCE. (See BURGLARY INSURANCE, EMPLOYERS' LIABILITY INSURANCE, FIRE INSURANCE, and NATIONAL INSURANCE.)

INTEREST ON BANK DEPOSIT. (See BANK DEPOSIT—INTEREST ON.)

INTEREST ON CAPITAL. A great deal of misapprehension exists in regard to the question of interest on capital. The inclusion of such an item in costs is generally supported on the grounds that a charge should be made against production for the use of capital.

From a *cost-finding* point of view, interest on capital as distinct from interest on loans, such as debentures, mortgages, or bank overdrafts, etc., is not an item of cost, since a "cost" should only comprise expenditure actually *incurred*. On the other hand, interest on capital may sometimes be taken into consideration when dealing with *cost estimating* for the purpose of comparing the cost of one operation or method of manufacture with another if a change in such method is contemplated.

With regard to methods of cost finding and the question of interest on capital, the definition of the term "total cost," also the principles of "cost finding," definitely exclude all anticipated expenses, and items of this nature should not therefore be included.

With regard to interest on debentures, loans, etc., the treatment of these items will vary according to the circumstances under which the liability is incurred, and reference should be made to the respective kinds of interest, i.e. "Debentures—Interest on," "Mortgages—Interest on," etc., for information on these separate items.

INTEREST ON DEBENTURES. (See DEBENTURES—INTEREST ON.)

INTEREST ON MORTGAGES. (See MORTGAGES—INTEREST ON.)

INVENTORY—PERPETUAL. (See STOCK RECORD CARD.)

INWARDS GOODS NOTE. (See GOODS RECEIVED—RECORD OF, and PURCHASING.)

ISSUING AND RECORDING. A term sometimes used when referring to this particular phase of storekeeping, and comprises the issue of materials or goods against a stores requisition, and the recording of the issue upon a bin card.

The issue and recording of goods may be said to follow that of storing and recording. (See STORES ROUTINE.)

JOB CARD. A clock card used by direct workers for the mechanical recording of the starting and finishing time on each job, process or operation, and by indirect workers for recording the time they spend on each service order or class of indirect work.

The rulings of job cards for direct workers differ according to the type of time recorder used, the method by which each worker is remunerated, and the method of cost finding ; for instance, with the piece work method there are required spaces for the quantity of work done, whereas with the day rate method only the " times " would be necessary. For illustrations of job cards, etc., see **BOOKING TIME TO JOBS—METHODS OF**; also **TIME RECORDERS**.

JOB COSTING METHOD OF COST FINDING. The basis of the job costing method is the costing of an individual job or piece of work. The job may be an order for a large quantity of articles or for one only or for a particular operation. In the engineering trades, for instance, the job may cover the manufacture of 1,000 camshafts or one flywheel cast to a special pattern ; likewise in a carpentry and joinery business, the order may be for 500 teak boxes or a single packing case. Whatever the article or quantity may be, the direct materials, direct labour, and its correct proportion of establishment expenses are charged to the particular order number, and the sum total constitutes the cost of the job, order or operation.

With most industries the work performed can be classified into two general groups, i.e. (1) work which directly relates to the manufacture of goods for sale, and (2) that class of work known as service or indirect.

The work performed in regard to group (1) will usually be authorized by a works order, production order or stock order, whereas with (2) the orders are known as service orders or standing works orders.

With the smaller sized concern the costing of a job will not present the same difficulties as with the larger concern, as the production orders will usually cover a less quantity of articles, whereas with the large concern, and especially those that manufacture on the mass production principle, the method generally becomes slightly more involved on account of the large quantities of articles or parts which have to be made. With the small concern one production order may be sufficient to cover the completion of a customer's order, whereas with the large concern the job will usually resolve itself into an order for the parts or particular operations that have to be performed in each department of the factory, instead of for the complete articles. For instance, assuming an order is received for 2,500-250 c.c. single cylinder petrol engines, the " job " will still be the 2,500 engines, but to assist production

control and the collection of the many items which go to make up the cost of the completed order, the articles to be made are divided into components or parts, and separate sub-orders issued.

In the case referred to, the main production order would be, say, No. 3,750. The names of each part of the complete engine are then listed, and the necessary quantity of each to make up the 2,500 engines is ascertained and sub-orders may not only be issued for each part, but also for the various operations on each part.

In addition to the sub-orders for the manufacture of the various parts, there will be issued orders for assembling the individual parts into units, and further orders for assembling the units into a complete machine.

The assembly orders may therefore be of two kinds ; firstly, there is the sub-assembly, i.e. the assembling of several parts into a complete unit, and secondly, the final assembly of these units into a complete engine. In the case of petrol engines there will be required further sub-orders to cover the testing of each engine.

Each class of sub-order would, therefore, be coded or given symbols to denote that they relate to the main order 3,750.

By splitting up the main order into the various parts of an article or its appropriate divisions for manufacturing purposes, and issuing a sub-order to cover each part or operation, it is possible to ascertain the factory cost of each part by charging all the materials and labour consumed to the respective sub-accounts.

Furthermore, by summarizing the total cost of each sub-order, it will not only enable the final cost of making 2,500 engines to be ascertained, but the cost summary can be arranged in such a manner as will clearly show the extent to which the various elements have entered into the final product.

A system of job costing when applied to certain industries is often referred to by different names ; for instance, the terms *class cost method* and *operation cost method* are often used to denote the job costing method when applied to the costing of goods by classes or operation, rather than by the individual unit ; in the case of the class cost method instead of the "cost" being separately compiled for one piece of machinery or article, the cost will simply cover a group of orders of the same type of product. Whilst the job covers the "class" rather than the "piece," we still have the job costing method,

but with a different unit or basis to that described in the preceding paragraphs.

To give one more instance, when a works order or production order covers an operation instead of a complete article or piece of machinery, the method is often referred to as the *operation cost method*. In most engineering works the operation method of costing is used as well as the ordinary job costing method, as it is sometimes found more convenient to cost certain articles or parts by "operation," due to the fact that a number of these articles or parts must be stocked in a part finished state for convenience in making up special orders.

With some industries many operations on a product are entirely the same up to a certain point, when the goods are then placed into stock in their semi-finished state. The articles are then drawn from stock when the final operation is performed to meet the special requirements of different customers. In such cases the operation cost method is necessary, as the finished state of the product cannot be ascertained until after the receipt of the customer's order.

It will now be observed that if a job costing method is to be installed, the unit for costing purposes, i.e. whether one will cost the complete article, the separate operations of each article, by classes of products, or even by a combination of all these units, will indicate the type of job costing system.

A brief consideration of job costing methods may be divided into four sections—

- | | |
|------------------------------|---------------------------|
| 1. Accounting for materials. | 3. Establishment expense. |
| 2. Accounting for labour. | 4. Cost summaries. |

1. Accounting for Materials. The routine that will be used in connection with materials will, firstly, depend upon the nature of the product and its method of manufacture, type of organization in the works, and the method of stores control. In many concerns the foreman of each department will requisition on the stores for any materials required, but whilst this method may work satisfactorily in smaller concerns, it is a practice that should not be recommended with the larger firms. To be effective it entails a considerable amount of checking by the Cost Department and the storekeeper; alternatively, a very elaborate system must be introduced in order to avoid over-issues. With such elaboration, however, it will rarely be possible to prevent the over-issue or unauthorized withdrawal of materials, as this will not become

apparent until *after* the material has been obtained. To avoid difficulties in this direction, therefore, the planning or other department of the factory should be the only department authorized to issue and sign stores requisitions for direct materials or parts required on a works order. In the case of sundry supplies for service orders, such as lubricating and cutting oils, solder, emery paper, small tools, etc., stores requisitions can quite conveniently be made out by the foreman and for this purpose a distinctive coloured stores requisition should be provided.

With the smaller concern the Planning Department may not form part of the organization, and in such cases the stores requisition may conveniently be made out by the head foreman or his assistant.

2. Accounting for Labour. The method used for booking time to jobs will depend upon the nature of work performed, the system of wage payment in use, and the nature and amount of information required. There are numerous methods of booking time to jobs, each of which has its special application, but for convenience they may be grouped according to the principles underlying each method as follows—

METHOD No. 1. Combined job and gate card—each worker provided with only one card for the pay week, and on which is recorded the times he enters and leaves the factory, also the time “on” and “off” each job.

METHOD No. 2. Combined job and gate card—each worker provided with only one card for the pay week as with method No. 1, but in addition there is used a master card for summarizing the labour cost of all the workers engaged on each job or order.

METHOD No. 3. Combined job and gate card—each worker being supplied with a separate card for each job or order on which he is engaged throughout the pay week. The times spent on each job and as shown by each card are entered on a summary in order to ascertain the total time for the pay week.

METHOD No. 4. Separate gate card and job cards—each worker provided with a separate job card for each job or order on which he is engaged.

METHOD No. 5. Separate gate card and one job card for week—each worker supplied with only one job card for use through the pay week.

METHOD No. 6. One job card for each order—one job card used per job or order when a series of standard operations are performed, used either with or without a gate card.

METHOD No. 7. Combined job card and machine running card—one job card per machine tool per week for analysing operator's time to each job, which also shows "time on production" and "idle time" of each machine tool.

METHOD No. 8. Booking time direct on works instruction sheet or work ticket.

Full details of each of the above methods are given under the heading of "Booking Time to Jobs," and a selection of any of these will entirely depend upon the points already mentioned.

3. Establishment Expense. The method used for recovering the establishment expenses in costs will depend upon the size of the factory and the nature of the work carried on. The methods most commonly used are known as—

1. Percentage on direct labour method.
2. Direct labour hour method.
3. Percentage on prime cost.
4. Departmental rate.
5. Machine rate.

The choice of any of the above methods, which are considered in detail under their respective headings, can only be made after a very careful investigation as the recovery of these expenses in a job costing system will be determined by the manner in which the costs are compiled, that is, by the job, process or the operation, etc. (See also **ESTABLISHMENT EXPENSE.**)

4. Cost Summaries. The method that will be used for summarizing the individual costs will depend upon the nature of the business, and the amount of information required by the management. In some cases the summary of a complete cost can conveniently be shown at the top of the Cost Account which is contained in the Job Cost Ledger, whereas with some industries it may be necessary to use special forms for this purpose. For instance, those firms which continually manufacture stock lines in either small or large quantities, will generally require their cost statistics in a form that will allow of easy reference. In such cases a card record system is often used, which is arranged to show the total and detailed costs of a complete order and the average cost of each article.

On the other hand, for those factories where the works or production order has been split up into sub-orders, a special form of cost summary is necessary. The object of these special forms will, firstly, be to summarize on one sheet the detailed material, labour, and expense items of each component, and,

secondly, to arrive at the final cost of the whole order by summarizing the cost of each sub-order on to a final cost summary sheet. Specimen rulings of cost summaries are given under that heading, and reference should be made thereto in order to obtain an idea as to the general layout of such forms—no special ruling can be advocated, as the type of article and the method by which it is manufactured will invariably decide the actual form of summary necessary.

The results obtained from any costing system should be reconciled with the total expenditure as shown by the financial accounts, and for this purpose it is desirable that a proper system of cost control accounts be instituted so as to enable frequent and automatic reconciliation.

JOB EVALUATION. Job Evaluation is the appraisal of a particular task relative to its remuneration of the employee performing it, giving accurate consideration to the skill, effort, and sense of responsibility necessary to do it satisfactorily.

Its first phase is a purely abstract appraisal. The job and not the man is rated, and Job Evaluation must not be confused with merit rating.

Job Evaluation has become of increasing importance to manufacturing industries in recent years because of the increasingly high organization and demand of modern production methods, wherein the processing is a series of specialist's tasks requiring varying degrees of skill and effort. It is essential to any scientific production and wage incentive plan. If administered impartially, it eliminates all difficulties in wage and salary levies between employees, male and female, doing comparable work whether in the same or different departments. It also establishes correct differentials for jobs of different worth. Furthermore, by establishing definite factors on which values can be based, Job Evaluation will bring new jobs in their proper relation to old jobs, provide a basis for promotions, and lessen grievances due to lack of confidence in managements' attitude towards labour relations.

There are various methods of Job Evaluation, and they can all be classified into four types—

1. Grading or classification.
2. Ranking.
3. Factor comparison.
4. Factor Point scoring.

Of these types, 3 and 4 are most generally used as they produce the more accurate results.

*Form No. 53.***JOB EVALUATION**

PRESENT JOB TITLE Technical Superintendent .**SUGGESTED JOB TITLE****IMMEDIATE SUPERIOR** Assistant Manager

JOB DESCRIPTION

The organization and direction of the Production Control Department and the co-ordination of the department activities throughout to ensure that operating units function at the maximum obtainable efficiency in yields, quality, material, and utilities' consumptions, and to prepare operating statements on plant performance.

RESPONSIBILITIES

The Technical Superintendent is responsible that the procedures under which operating departments function are such that maximum plant efficiency is obtained. He is responsible for process improvements, development to eliminate operating difficulties, substandard efficiencies, and conditions. The Superintendent is responsible that feed stock, manufacturing supplies, and inventories are maintained at optimum economic level, and for the preparation of operating statements and summaries and reports on special problems, economic surveys, and plant budgets. The Technical Superintendent is responsible for the personnel administration of the department, the delegation and allocation of duties, responsibilities, and authorities—schedules of work, holidays, recommendations on promotion, rates, transfers, and discipline, and for the development and training of personnel, as well as co-ordinating the activities of department personnel into other departments, and for the interpretation of Policy as it applies in the department.

CONSEQUENCE OF ERRORS

Incompetence or indifference in handling this department would result in an immediate loss in discipline and co-ordination, with accompanying high losses in operating efficiency of the plant. Unchecked inefficiencies would accumulate into heavy losses in materials, supplies, and utilities. Faulty judgment on process design, unless submitted to outside authority, could result in useless equipment installation or incorrect procedures.

SUMMARY

SALARY RANGE	JOB RATING	JOB CODE
£1,750-£2,500	7350	25.202 (Production Control)

EDUCATION AND SKILL

Bachelor's degree in Engineering or equivalent with at least four years' experience as Production Controller, and an intimate technical and operating knowledge of the processes as applied at . . . and elsewhere. He must have the facility of organizing and directing in allocation of duties, responsibilities, and authorities to supporting staff, and to co-ordinate the staff harmoniously into the activities of other departments, process, laboratory, engineering, and other subsidiary companies.

SPECIAL

EFFORT

MENTAL 95%

VISUAL

PHYSICAL 5%

WORKING CONDITIONS

Good—office 2nd floor Administration Building.

REMARKS

The office of Technical Controller is critical. On it depends the co-ordination of effort and the co-operation procedure whereby process is supported and functioned by all other company activities and services. Promotion to this job is most logically from most senior and experienced Production Controller. Promotion from this job is to Process Superintendent or Research and Development, or by an enlargement of field of activities over this department.

INTERVIEWED		EVALUATED		CHECKED	APPROVED
BY	DATE	BY	DATE		

Job Description. The first step in any method of Job Evaluation is clearly and accurately to describe each job. This must be done irrespective of the method used. To determine the variation between jobs, it is necessary to know what skill, education, and experience is needed to do a job, how it should be done, and under what conditions. A special form should be used for this purpose, and a specimen of such a form, on which has been entered the necessary information, is given on pages 198 and 199 (Form No. 53).

Job titles frequently present a problem in the work of the Job Analyst, as the same job may often be called by different titles, or different jobs may have the same title. This situation must be corrected before Job Evaluation can proceed. Each job title should be confined to a separate and distinct job on which one or more employees may be engaged.

Descriptions of the duties of all jobs should be sufficiently complete to give the Job Rater adequate information on which to base his decision. The exact amount of detail that should be entered on the Job Description form can only be determined by experience. One method that is commonly used is to describe the duties under the headings of: routine, periodic, and occasional. This method is good on clerical or salaried jobs, but is not very effective for hourly-paid workers or works jobs.

Securing data on the physical characteristics of any job depends primarily upon the analyst's power of observation and his experience in the measurement of human or physical effort.

The information needed for job descriptions is sometimes obtained by means of a questionnaire, but this method is unsatisfactory, as both employees and supervisors will tend to over-state the importance of a job or omit essential details. The more practical method of obtaining the information is by observation of the job and discussion with the worker and supervisor. By this means every job is described as it is actually performed.

All job descriptions should be clear, concise, and complete. Too much detail may lead to grievances whenever the duties of a job change, whereas the omission of pertinent details may lead to incorrect valuation.

After all job descriptions have been completed, they should be carefully checked with the supervisor or department head. The next step is to evaluate each job according to the method adopted.

1. Grading or Classification Method. This method of Job Valuation is based upon the classifying of all jobs into a number of grades or groups. First, the basic types of jobs are determined and carefully defined. The number of such basic jobs or grades will vary from one concern to another. A simple form of grading may be unskilled, skilled, supervisory, directing, executive, and administrative.

After grades have been established, each job description is reviewed and the job placed in its correct grade. After all jobs have been graded, the jobs in each grade are ranked as a further refinement.

2. Ranking Method. With this method the job descriptions are graded from the highest to the lowest according to their relative responsibility and difficulty. Each job is evaluated in terms of other jobs and not in wage rates. The rates are then checked in the locality.

Ranking and grading methods are so similar that they are regarded as a single method. They have the same advantages and disadvantages. They are simple and easy to install, and practical for a very small works with relatively few jobs. On the other hand, they are limited in effectiveness, as the evaluation of a job as a whole cannot give an accurate measurement of its worth.

3. Factor Comparison Method. The weakness of the Grading and Ranking methods led to the development of a method based upon the principle of breaking a job into its component parts and evaluating each part separately.

From the job descriptions, key jobs are selected, and each job is ranked under the following factors—

1. Mental Requirements.
2. Skill Requirements.
3. Physical Requirements.
4. Responsibility.
5. Working Conditions.

Each factor is then evaluated by apportioning the existing rate of pay to the five factors. A key-job evaluation sheet is used having the job titles in the left-hand column, the factor in the following five columns, and wage rates in the extreme right-hand column.

4. Factor Point Scoring Method. There are many different plans in use, but all of them are based on the point system. Under this method, job factors are assigned a proportionate share of the maximum number of points. Each factor is analysed in terms of degrees, which are given a proportionate

share of the total points for the particular factor. By selecting the proper degree of each factor for each job, its valuation in points is determined.

All point plans recognize six major job factors, i.e. mentality or education, experience or skill, complexity of duties, responsibility, effort, and working conditions. Each of these major factors are too broad to provide accurate evaluation, and they are further analysed to provide a broader base for valuation purposes.

Mentality refers to the general educational background an employee brings to the job as opposed to what he learns on the job. It includes both scholastic and trade or technical education.

Experience or skill includes all that a worker learns on the job and is generally measured in terms of time. The requirements of a job should be established by the period of time required by the average employee to develop the mental and physical habits necessary to become an efficient operator.

Complexity of duties has reference to the general intelligence or creative ability that the job calls for. This factor is sometimes referred to as initiative or aptitude, etc., with some methods of Job Evaluation. It is very difficult to define, but can be referred to as that kind of skill which cannot be consistently acquired through education or experience.

Responsibility. Every job requires that the employee accept some responsibility beyond getting his work done satisfactorily, and it is this responsibility requirement that forms the basic evaluation. Responsibility can be inherent in a job or it can be assigned by management, and because of the difference between these two types of responsibility it is usual for separate factors to be set up, namely, responsibility for results (inherent in the job) and responsibility for supervision (assigned responsibility).

Employees in clerical and technical jobs carry greater responsibility than people in factory jobs, and the responsibility factors should be analysed to enable a correct assessment of factor points. The following breakdown is recommended—

1. Responsibility for results.
2. Responsibility for errors.
3. Responsibility for contact with others.
4. Responsibility for supervision.

Effort. This factor is usually divided into physical and mental effort. Physical effort is unnecessary for clerical or

technical jobs, but enters into all jobs in the plant. Physical effort measures the intensity of effort on a job and which must take into consideration the time an individual is normally under load. It includes muscular effort, difficult work positions, and the continuity of effort.

Mental effort is the required co-ordination between eye, mind, and hand, or the nervous energy consumed in a purely physical sense.

Working Conditions refer to the disagreeable and dangerous job features that cannot be controlled by the worker. These features include difficult working positions: dusty, noisy, hot or cold conditions in the work area; also working with greasy, abrasive or acid materials. Such items as night shift assignments, work in outlying districts, etc., also form part of the working conditions.

Degrees of Each Factor. In order to determine how much one job differs from another, each factor is divided into degrees. The lowest degree of "experience," for example, might represent only a few days' experience on a job, the highest might be 5, 7, or 10 years' experience. An example of degree definitions for "Responsibility—safety of others," and taken from the Job Evaluation plan adopted by the National Metal Trades Association in the United States, is given below. The degrees of all factors are dealt with in a similar manner.

RESPONSIBILITY FOR SAFETY OF OTHERS

This factor appraises the care which must be exercised to prevent injury to others and the probable extent of such injury. Injury to the employee on the job being rated is to be considered under unavoidable hazards. Consider possible accidents to others resulting from careless operation of machine or handling of materials or tools. Can other employees be injured by carelessness on the job? If so, how?

1st Degree. Little responsibility for safety of others. Job performed in an isolated location, or where there is no machine involved and the material is very light.

2nd Degree. Only reasonable care to own work necessary to prevent injury to others; and accidents, if they should occur, would be minor in nature, such as cuts, bruises, abrasions, etc.

3rd Degree. Careless operation of machine or performance of duties may cause lost time accidents to others, such as crushed toes, feet, fingers or hands, eye injuries.

4th Degree. Constant care necessary to prevent serious injury to others, as a result of inherent hazards of the job, but where such other employees may act to prevent being injured.

5th Degree. Safety of others depends entirely on correct action of employee on job being rated and carelessness may result in fatal accidents to others.

share of the total points for the particular factor. By selecting the proper degree of each factor for each job, its valuation in points is determined.

All point plans recognize six major job factors, i.e. mentality or education, experience or skill, complexity of duties, responsibility, effort, and working conditions. Each of these major factors are too broad to provide accurate evaluation, and they are further analysed to provide a broader base for valuation purposes.

Mentality refers to the general educational background an employee brings to the job as opposed to what he learns on the job. It includes both scholastic and trade or technical education.

Experience or skill includes all that a worker learns on the job and is generally measured in terms of time. The requirements of a job should be established by the period of time required by the average employee to develop the mental and physical habits necessary to become an efficient operator.

Complexity of duties has reference to the general intelligence or creative ability that the job calls for. This factor is sometimes referred to as initiative or aptitude, etc., with some methods of Job Evaluation. It is very difficult to define, but can be referred to as that kind of skill which cannot be consistently acquired through education or experience.

Responsibility. Every job requires that the employee accept some responsibility beyond getting his work done satisfactorily, and it is this responsibility requirement that forms the basic evaluation. Responsibility can be inherent in a job or it can be assigned by management, and because of the difference between these two types of responsibility it is usual for separate factors to be set up, namely, responsibility for results (inherent in the job) and responsibility for supervision (assigned responsibility).

Employees in clerical and technical jobs carry greater responsibility than people in factory jobs, and the responsibility factors should be analysed to enable a correct assessment of factor points. The following breakdown is recommended—

1. Responsibility for results.
2. Responsibility for errors.
3. Responsibility for contact with others.
4. Responsibility for supervision.

Effort. This factor is usually divided into physical and mental effort. Physical effort is unnecessary for clerical or

technical jobs, but enters into all jobs in the plant. Physical effort measures the intensity of effort on a job and which must take into consideration the time an individual is normally under load. It includes muscular effort, difficult work positions, and the continuity of effort.

Mental effort is the required co-ordination between eye, mind, and hand, or the nervous energy consumed in a purely physical sense.

Working Conditions refer to the disagreeable and dangerous job features that cannot be controlled by the worker. These features include difficult working positions: dusty, noisy, hot or cold conditions in the work area; also working with greasy, abrasive or acid materials. Such items as night shift assignments, work in outlying districts, etc., also form part of the working conditions.

Degrees of Each Factor. In order to determine how much one job differs from another, each factor is divided into degrees. The lowest degree of "experience," for example, might represent only a few days' experience on a job, the highest might be 5, 7, or 10 years' experience. An example of degree definitions for "Responsibility—safety of others," and taken from the Job Evaluation plan adopted by the National Metal Trades Association in the United States, is given below. The degrees of all factors are dealt with in a similar manner.

RESPONSIBILITY FOR SAFETY OF OTHERS

This factor appraises the care which must be exercised to prevent injury to others and the probable extent of such injury. Injury to the employee on the job being rated is to be considered under unavoidable hazards. Consider possible accidents to others resulting from careless operation of machine or handling of materials or tools. Can other employees be injured by carelessness on the job? If so, how?

1st Degree. Little responsibility for safety of others. Job performed in an isolated location, or where there is no machine involved and the material is very light.

2nd Degree. Only reasonable care to own work necessary to prevent injury to others; and accidents, if they should occur, would be minor in nature, such as cuts, bruises, abrasions, etc.

3rd Degree. Careless operation of machine or performance of duties may cause lost time accidents to others, such as crushed toes, feet, fingers or hands, eye injuries.

4th Degree. Constant care necessary to prevent serious injury to others, as a result of inherent hazards of the job, but where such other employees may act to prevent being injured.

5th Degree. Safety of others depends entirely on correct action of employee on job being rated and carelessness may result in fatal accidents to others.

COMPARISON OF SIX POINT DISTRIBUTION PLANS

Form No. 54.

	NATIONAL METAL TRADES ASSOCIA- TION		GENERAL ELECTRIC CORPORATION		WESTINGHOUSE ELECTRIC CORP'N		REVERE COPPER AND BRASS INC.		U.S. STEEL CORPORATION		BENDIX AVIATION CORPORATION	
	Factors	Points %	Factors	Points %	Factors	Points %	Factors	Points %	Factors	Points %	Factors	Points %
EXPERIENCE OR SKILL	Education	14	General	50-0	Education	18-5	Training	15-7	Education	10	Education	15
	Experience	22	Mentality	12-5	Experience	18-5	time	10-5	Experience	12	Experience	25
	Initiative	14			Aptitude	23-0	Manual	10-5	Manual	23	Initiative	15
	Total	50	Total	52-5	Total	60-0	Total	26-2	Total	45	Total	55
EFFORT	Physical	10	Physical	6-25	Physical	7-4	Physical	10-5	Physical	10	Physical	6
	Mental	5	Mental	6-25	Mental	7-4	Mental	10-5	Mental	6	Mental	6
	Total	15	Total	12-50	Total	22-2	Total	21-0	Total	21	Total	18
RESPONSIBILITY	Equipment	5	General	12-5	Equipment	4-7	Equipment	5-3	Equipment	5	Equipment	4
	or process				or process		or process		or process		or process	
	Material or	5			Material or	4-7	Material or	21-1	Material or	9	Material or	4
	product				product		product		product		product	
	Safety of	5			Safety of	4-7	Work of	5-3	Safety of	5	Confidential	4
	others				others		others		others		data	
	Work of	5							Work of	5	Reports and	4
	others								others		records	
	Total	20	Total	12-5	Total	14-1	Total	31-7	Total	24	Total	16
JOB CONDITIONS	Working	10	Working	12-5	Unavoidable	3-7	Working	10-5	Working	4	Working	6
	conditions		conditions		hazards		conditions		conditions		conditions	
	Unavoidable	5					Health	5-3	Health	5	Unavoidable	5
	hazards						Current	5-3	Current	1	hazards	
	Total	15	Total	12-5	Total	3-7	Total	21-1	Total	10	Total	11

A comparison of six point distribution is given (Form No. 54) to illustrate how the major factors are built up for different firms according to their individual requirements.

The requirements of each firm will determine the point distribution plan. In some cases an extensive point plan will not be called for, but in others a more detailed appraisal of jobs may require a fairly extensive point listing, and an example of this is given below.

POINT VALUES

Responsibilities

Company Policy—Final Decisions	2000
Direct Influence	1500
Indirect Influence	1000
Administration	1000
Control of Division	1500
Asst. Control of Division	1200
Functional Manager	1000
Development and Research	1000
Control of Department	1000
Asst. Control of Department	800
Production and Process	750
Supervision of Foreman	800
Supervision of Employees	550
Inspection—Maintenance Equipment	450
Maintenance	400
Production	500
Records	500
Routine	500
	— 16,450

<i>Working Conditions</i>	
Normal	250
Sub-Normal	500
Hazardous	750
	— 1,500

<i>Skill</i>	
Education	1500
Training	1000
General Knowledge	750
Manual	500
	— 3,750

<i>Effort</i>	
Mental	1000
Physical	750
	— 1,750

Wage Administration. After a Job Evaluation has been completed and the wage scale determined, the actual earnings of all employees should be compared with the wage scale. Jobs which are underpaid should be revised upwards as soon

as possible to bring them into line with other jobs. Dealing with overpaid jobs is more difficult, as it is seldom practical to reduce them to within their grade rate. In general practice these workers are carried at existing rates and promoted or "upgraded" to jobs with higher classification. Upgrading is the best solution, providing the worker is capable of qualifying for the higher job. In cases where a worker cannot qualify, it is preferable that he be retained on his present job and not receive any increases as long as his wage exceeds the wage scale.

Whenever working conditions, methods, or tools change, a revaluation should be made. A job should never be revalued simply because a number of employees have reached the maximum wage limit and want an increase in pay beyond the scale fixed by the plan. Increasing a rate for this reason is not justified, as it will distort the entire wage structure and negative the advantages and purposes of Job Evaluation.

Continued revaluation will keep the wage structure balanced, as well as place management in a good bargaining position when a trades union agreement has to be renegotiated and renewed.

KNOEPPLE BONUS WAGE INCENTIVE PLAN. The daily rate is guaranteed, and it is calculated by adding to the standard time 25 per cent of the time taken and multiplying by the hourly rate. The bonus starts at 67 per cent of normal output with a "step" of 5 per cent at the standard, and the scale is slightly more liberal than the Emerson bonus up to 95 per cent. The usual danger exists in any system incorporating the guaranteed daily rate of the less ambitious workers not trying for the bonus.

It is claimed to be very flexible in application. A mild system and the "step" at standard output is a good feature.

The cost per piece produced is comparatively low, somewhere between that of the Gantt and Emerson schemes. (See also WAGE INCENTIVE.)

LABOUR CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

LABOUR COST COLLECTING SHEET. A form on which the detailed amounts of direct labour are summarized in order that the total labour cost of a job, order or series of operations can be ascertained. The use of such a form is usually confined to those industries where the works or production order covers a large quantity of articles, or where a large number of workers

are engaged upon a particular operation or process. In such cases a considerable number of items relating to direct labour require summarizing before the cost of the production order can be completed, and the use of a collecting or summarizing sheet for each element of cost will sometimes facilitate this process. The extent to which labour collecting sheets will be used and the form of ruling will depend upon the method of cost finding, the nature and size of the business, and the amount of information required by the management.

For instance, the summarizing of the labour amounts as obtained from the job cards may sometimes be done with the aid of an adding and listing machine, and the specimen labour collecting sheet, on page 207, illustrates the type of form used under such conditions. The final compilation of the labour cost of a job may be deferred until all the work on the particular order is completed, and in such cases the job cards when received by the Cost Department will be sorted and filed according to job number, so that on completion of the job the whole of the cards can be taken from the files and summarized by being passed through an adding or listing machine.

Alternatively, it may be the practice to summarize the labour cost each week, and in such a case the job cards will be dealt with exactly as above, and the weekly amount entered on the collecting sheet.

The illustration given overleaf allows for this procedure, as the date of the pay week is inserted in the left-hand column, and the amount relating to each operation entered in the appropriate column.

By using separate collecting sheets for both direct labour and direct materials, it enables the part cost of a job to be ascertained at any time. The use of such forms, however, will entirely depend upon the actual routine of the Costing Department and the nature of the work performed. For instance, instead of summarizing the direct labour as described above, the nature of the industry may be such that the various kinds of labour will require to be summarized in the manner indicated by the further example of labour collecting sheet given on page 34. The ruling of this form is arranged to summarize the daily times of each worker and also give a weekly total, and is specially suitable for summarizing the labour cost of standard production, or where progressive totals are necessary.

The use of labour collecting sheets will usually be confined to the job method of cost finding, although in exceptional instances they will be found of advantage with process methods of costing, and especially where a departmental analysis of wages cannot be obtained from the pay roll.

LABOUR—DIRECT. (See DIRECT LABOUR.)

LABOUR—INDIRECT. (See INDIRECT LABOUR.)

LAND—MAINTENANCE OF. The expense covered by this item, which will usually include the maintenance of all roads, paths, and fencing, etc., is collected through the system of service orders. The analysis of such expense will depend upon the nature of the work that is usually performed and the size of the property. With the small concerns, for instance, the expense is generally included with the maintenance and repair of buildings when the value of repairs to roadways, etc., is small, but with larger firms it may be necessary to segregate this expense from all building charges by using a system of service orders.

The cost of repairing the main roads is apportioned over all the factory departments, either arbitrarily or on the basis of the number of men in each department. This latter method, however, is unsuitable if the roads are also used by heavy traffic in delivering and dispatching goods or materials, and in such cases a more equitable distribution will be arrived at if the greater proportion of the expense is allocated to the Stores and Shipping Department.

The maintenance charges of footpaths and fencing, etc., may be apportioned arbitrarily or on the basis of "per employee," but in the majority of cases it will be preferable to include it with the maintenance charges of buildings.

LEGAL EXPENSES. Legal expenses of a general character are a charge to administrative expenses, which are ultimately apportioned over the Factory and Selling Departments, but those expenses which are incurred in the recovery of accounts may be allocated to selling expense if the amount involved should warrant it. (See ESTABLISHMENT EXPENSE.)

LIGHTING. The expense of lighting is a charge to establishment expenses, the amount being allocated to the factory, selling, and administrative sections either (1) arbitrarily, (2) on the basis of actual consumption obtained from meter readings, or (3) calculated on the basis of the total watts or candle-power or the number of lamps burnt in each department.

LIST PERCENTAGE PLAN—WAGE INCENTIVE. This is an American variant of the cost premium. The foreman acts as a contractor and undertakes to supply labour at a fixed cost per unit of product. The labour cost is the equivalent of a percentage of the selling price, and is arrived at after a careful analysis of the cost figures ; for example, a foreman in charge of a department, where the normal labour cost per unit is 3 per cent of the selling price, would be credited with his output at this figure per unit. Any saving which he can effect is shared between himself and his men.

The two principal defects are that it concentrates on only one point of workshop efficiency—the efficiency of labour ; and, secondly, that as the labour cost is based on the selling price, there must necessarily be frequent adjustment owing to market fluctuations. (See also **WAGE INCENTIVE**.)

LOANS—INTEREST ON. (See **DEBENTURES: MORTGAGES—INTEREST ON**, also **BANK OVERDRAFTS**.)

LONG-TERM EXPENSES. (See **CONSTANT EXPENSES**.)

LOOSE PLANT OR LOOSE TOOLS. Machinery and tools required for manufacturing purposes, which have no fixed or definite location in the factory and can be moved freely from one part to another.

MACHINE CARD. (See **PLANT RECORD CARD**.)

MACHINE GROUPS. (See **GROUP CENTRES FOR EXPENSE ALLOCATION**, also **MACHINE RATE METHOD OF RECOVERING FACTORY EXPENSES**.)

MACHINE RATE METHOD OF RECOVERING FACTORY EXPENSES. In those industries where the manufacturing processes wholly or partly require the use of machinery, there may be used the “ machine rate ” method of recovering the factory expenses in costs.

This method is based on the principle that with the class of industry referred to, the total factory expense is made up of two distinct kinds, and that all the expenses relating to the general running and upkeep etc., of the machine tools, i.e. machine expense, should be recovered in costs separately from the remaining expenses of the factory departments.

The basis of recovery of a machine rate is the length of time each article, order or process has required the use of the machinery, and this method differs from the direct labour hour or percentage on direct labour method in that expenses are recovered as a machine rate instead of a percentage or rate per direct labour hour ; in other words, the running times of

the machines form the basis of recovery and not the number of hours of direct workers or the amount of wages paid to them.

The machine rate method can rarely be adopted as the only basis for recovering the *whole* of the factory expenses, as there is usually one or more departments of exclusively hand work, or partly hand work and partly machine work, in addition to those departments that are entirely composed of machine work. A separate method, therefore, must be used for recovering those expenses which are not capable of direct allocation or apportionment to the machine expense, and in this direction a machine rate when used in combination with the direct labour hour method, for recovering the remaining departmental expenses, will undoubtedly give the more accurate results.

The calculation of a machine rate is effected by analysing the machine expense to each machine or group of machines, and then reducing the total to a rate per machine hour, by dividing it by the estimated number of hours each machine or group of machines should run throughout the period, and which may be expressed by the following formula—

$$\frac{\text{Total machine expense per machine or group of machines}}{\text{Total machine running hours per machine or group of machines}} = \text{Rate per hour per machine or group of machines.}$$

The predetermination of the total machine expense may be based upon the full normal running hours or upon a reduced number of hours during periods of trade depression, and the advantages of the former and objections to the latter methods are discussed under the general consideration of "Establishment Expense."

Classification of Factory Expense. The extent to which the factory expense is classified into the two main groups of machine expense and general shop expense greatly differs in practice. In some instances the cost accountant will apportion every item of factory expense over the two accounts and, whilst such a detailed analysis is only necessary in a few exceptional cases, it is a practice which should not be followed indiscriminately, as needless elaboration renders the method far too intricate and expensive.

The analysis of rent expense, for instance, on the basis of floor space occupied by the machines is in almost every case unnecessary, as the amount chargeable to a machine will be

found to be infinitesimal, as also shop cleaning and sweeping, lighting, general labouring, etc.

The items chargeable to the machine expense should, therefore, be limited to those expenses which have a *direct* bearing on the cost of running and maintaining, etc., the machines, and such expenses will chiefly consist of—

1. Cost of power.
2. Cost of repairs and maintenance.
3. An allowance for wear and tear and obsolescence.
4. Sundry supplies, such as lubricating and cutting oils, cotton waste, etc.

All the remaining items of factory expense are best dealt with as a charge to general shop expenses, and recovered in costs by the direct labour hour method on a departmental basis.

With regard to the few exceptional cases where a more detailed apportionment is necessary, it may be desirable to analyse the factory expenses, firstly, under the headings of—

1. Machine expense
2. Material expense.
3. General shop expense.

Secondly, to deal with groups 2 and 3 according to the basis chosen for their recovery in costs ; for instance, if the whole expenses are to be recovered on the basis of a combined machine rate and material expense rate, then group 3 will require to be apportioned over groups 1 and 2. On the other hand, if the expenses are recovered as a combined machine rate and a direct labour hour rate, then group 2 may either be apportioned over groups 1 and 3 or the total included with group 3.

Assuming the factory expenses to be classified into the two headings of machine expense and general shop expenses, the respective amounts are, firstly, analysed to departments, and the departmental total of the machine expense is then directly allocated or apportioned to the respective machines or group of machines in each department as follows—

1. **COST OF POWER.** The power consumed by the machines is capable of direct allocation on the basis of kilowatt hours consumed ; alternatively, if the actual consumption of each machine is not recorded, the amount can be apportioned on the basis of the horse-power required when running on full load.

2. **REPAIRS AND MAINTENANCE.** The expense of repairs and upkeep, etc., which will include the maintenance of the equipment and small tools used by each machine or group

is ascertained and analysed by means of a system of service orders.

3. **WEAR AND TEAR, ALSO OBSOLESCENCE.** The amount of depreciation of each machine is easily obtainable from the plant or machinery record.

4. **SUNDRY SUPPLIES.** The amount of sundry supplies required for the machines is obtained through a system of service orders, but in many instances the value of such supplies may be small and it may, therefore, be desirable to charge this expense to the service orders relating to repairs and maintenance.

Classification of Machinery. The classification of machinery for the purpose of using a machine rate will be more or less arbitrary, depending upon the nature and size of the concern and the class and type of machinery used. With well organized factories a broad classification may already exist by way of departments which may be sufficient for a small or medium-sized works, but with the larger concern it will usually be necessary to subdivide the machine tools according to functions, for instance, the departmentalization of the small factory may be such as will only give the classification of machines as—

Light machine shop.

Heavy machine shop, etc., etc.,

whereas with the larger concern the departments may be arranged as follows.

Lathe Department.

Milling Department.

Drilling Department.

Planing Department.

Grinding Department

Buffing and Polishing Department, etc., etc.

In the case of the former the machinery used in the light and heavy machine shops will require subdividing, according to functions, which may be—

LIGHT MACHINES.	Lathes.	Automatics.
	„	Engine.
	„	Screw-cutting.
	„	Capstan, etc., etc.
	Drills.	Bench.
	„	Single.
	„	Multiple, etc., etc.
	Milling machines, etc., etc.	

HEAVY MACHINES. Planing machines.
 Boring machines.
 Slotting machines.
 Radial drills.
 Grinding machines, etc., etc.

With the very large concern, and where the factory departments practically coincide with each kind of machinery used, the sub-classification may, firstly, take the form of type, and, secondly, the size or capacity; for instance, the Lathe Department may comprise a variety of different types of lathes, such as capstans, engine, automatics, gear cutting, etc., and each of these types may then be classified according to capacity. In the case of turret lathes, this sub-classification may be—

Symbol.	Swing.	Length of Bed.
<i>TA</i>	10-15"	4-7'
<i>TB</i>	12-16"	8'
<i>TC</i>	16-18"	7'-10'6"
	etc., etc.	

It should be noted, however, that the above remarks regarding the classification of machinery are only given to illustrate the variety of methods that are used, as the extent to which the machinery will require to be classified in any particular factory will entirely depend upon the number of machine tools in use, their type and size, etc.

Calculation of a Machine Hour Rate. Assuming that from the estimates prepared as above the expenses have been analysed into a machine expense and general shop expense as follows—

ITEM.	Total.	Light Machine Shop.	Heavy Machine Shop.	Fitting.	Testing.	Etc.
Machine Expense	£28,965	£9,275	£14,050	£3,732	£1,908	—
General Shop Expense	£28,487	£7,812	£4,025	£9,150	£7,500	—
Normal Maximum Machine Hours	138,600	50,000	38,000	45,000	5,600	—
Direct Labour Hours	228,000	75,000	42,000	61,000	50,000	—

The above figures show the expense analysed to departments, and in those cases where a variety of machine tools are used, the next step will be to analyse the machine expense to the respective classes of machine tools as follows—

LIGHT MACHINE SHOP

EXPENSE.	Total.	Auto- matic.	Engine.	Gear Cutting.	Etc.
Machine Expenses .	£9,275	£3,600	£675	£5,000	—
Machine Running Hours .	50,000	24,000	6,000	20,000	—
Machine Hour Rate .	—	3/-	2/3	5/-	—
General Shop Expense .	£7,812	—	—	—	—
Direct Labour Hours .	75,000	—	—	—	—

The general shop expense rate for each department will next be calculated, and the direct labour hour rate for the light machine shop, for instance, would be as follows—

$$\frac{£7,812}{75,000 \text{ (direct labour hours)}} = 2/1 \text{ per direct labour hour for the light machine shop.}$$

The machine hour rate to be added to costs would, therefore, be at the rate of 3s. per hour for the number of hours the automatics are used on an order ; 2s 3d. per hour for engine lathes, and 5s. per hour for gear-cutting lathes, etc.

The direct labour hour rate for the department, i.e. 2s. 1d. per hour, will next be added to the cost by multiplying the total direct labour hours of the direct workers engaged in operating the machines or performing other work on the job, such as bench work, fitting, etc., which has not required the use of machinery.

It will be seen that when the machine rate is used in conjunction with the direct labour hour method, the combination provides for the varying conditions of production, and especially in those cases where the machine tools used on each order vary as regards type and length of period in operation. For instance, one works order may require the use of expensive machinery to a much greater extent than another, whereas others may only partly require the use of the cheaper rated machines. Furthermore, due allowance will be made in those cases where two or more men are in charge of the one machine tool. As an example, assume one man in charge of a

planing machine and that the cost of the operation is as follows—

	£	s.	d.	£	s.	d.
Materials	15	-	-			
Direct Labour—						
One man, 136 hours at 2/6 per hour	17	-	-			
				32	-	-
General Shop Expense—						
Direct labour hours: 136 at 2/- per hr.	13	12	-			
Machine Expense—						
136 hours at 3/9 per hour	25	10	-			
				39	2	-
TOTAL FACTORY COST				£71	2	-

Again, assume the same operation, but in this instance two men are in charge of the machines—

	£	s.	d.	£	s.	d.
Materials	15	-	-			
Direct Labour—						
One man, 136 hrs. at 2/6	£	s.	d.			
per hr.	17	-	-			
One man, 136 hrs. at 1/-						
per hr.	6	16	-			
				23	16	-
272 hrs.				38	16	-
General Shop Expense—						
272 hours at 2/- per hour	27	4	-			
Machine Expense—						
136 hours at 3/9 per hour	25	10	-			
				52	14	-
TOTAL FACTORY COST				£91	10	-

It will be noted from the above that the machine hours are the same in each case, but that the number of direct labour hours has increased with the second example, owing to the fact that two men are employed.

The advantage of this method, which provides for the varying conditions, is clearly shown by the addition of an extra amount of the general shop expense. The advantage of a combined machine rate and direct labour hour rate for general shop expenses over the direct labour hour method will now be apparent, as the combined method makes every allowance for a job that partly or wholly requires the use of machinery, and one that may be wholly or partly hand work.

MACHINERY—DEPRECIATION OF. The amount of depreciation which relates to producing machinery is included

among factory expenses. When a large number of machine tools are in use, and the machine rate method for recovering expenses in costs is employed, the depreciation charge will require to be analysed either to departments, groups of machines, or to individual machines, and for this purpose a record of each machine, which may be ruled similar to the plant record shown on page 322, must be used.

MACHINERY—RECORD OF. (See PLANT RECORDS.)

MACHINERY—REPAIRS AND MAINTENANCE OF. The expenditure incurred in maintaining and keeping in good order all producing machinery will be dealt with in costs according to the amount of machinery used; for instance, with the smaller concern the repair and maintenance charges may be debited *en bloc* to the factory expense, and recovered as a general charge over the whole output, whereas with larger concerns it is usually desirable, owing to the largeness of this expense item, to analyse all expenditure by means of service orders either to each department, machine tool, or group of machines.

The method used for recovering factory expenses in costs will also affect the method of analysing repair charges, as the employment of a machine rate requires that expenses of each machine or group be ascertained separately.

The analysis of repair charges by means of service orders is regarded as the best method when a large number of machine tools are in use, and in connection therewith there will generally be used a machine record card, ruled similar to the plant record card, for each machine tool, so that the total cost of upkeep can be recorded together with other charges for depreciation, etc.

The expense of repairs and maintenance will generally fall into two divisions—

(a) Repairs which occur daily, such as to small tools, miscellaneous equipment, belting, etc.

(b) Repairs of an extraordinary character, the cost of which is more correctly distributed over a long period of time. This expense may include the replacement of certain parts or work done which exceeds a predetermined figure.

The question of depreciation may sometimes affect the method of dealing with repairs and maintenance charges, as it may be the practice to debit such charges to Depreciation Account for the reason that when establishing depreciation rates, the estimated cost of repairs and maintenance was taken into consideration. (See also REPAIRS AND MAINTENANCE.)

MAINTENANCE. (See REPAIRS AND MAINTENANCE.)

MAN HOUR METHOD OF RECOVERING EXPENSES.

(See DIRECT LABOUR HOUR METHOD OF RECOVERING EXPENSES.)

MANAGEMENT THROUGH ACCOUNTS. A term which denotes a method of management where a standard of performance in all departments of a business is predetermined and maintained. Management through accounts must not be confused with Budgetary Control, Standard Costing, or other methods that simply provide for the predetermination of a "cost" and the checking of the actual with the estimated upon completion of the job, order, or process. Management through accounts is the modern and logical development of Budgetary Control as introduced many years ago, it is an instrument of control and direction for the whole business, and if applied correctly enables management to function with the maximum of efficiency and precision.

Budgetary Control has developed considerably during recent years and now forms the basis of a method on which the more successful concerns have built up their organizations. In America, for instance, the method has been developed to such an extent that it has ceased to be looked upon as a branch of costing or accounting; the manufacturing, selling and financial activities of a business are definitely controlled and managed on this basis and the system is now generally referred to as management through accounts. In the author's opinion the term management through accounts more correctly describes the subject as it has now definitely become a method of management rather than a branch of cost accounting.

The older method, whereby a budget is set up and a comparison made at the end of each month or other period between the results achieved and the forecast, failed because of the rapidly changing conditions of modern business and the growing complexity of business management and administration. It became less possible for an individual to maintain proper control over a business simply by intuitive faculties which had been developed over years of experience, or to wait until the month end before knowing whether the budget had been exceeded or achieved. A more definite form of management was needed and which has been provided by the method known as Management Through Accounts.

To install and develop such a method requires considerable skill and managerial ability in addition to a comprehensive knowledge of costing and financial accounting. A systematic

method of collecting information respecting the past and present, of expenses, potential sales, production, fluctuations in material prices, finance, etc., must first be established, and from this, and other information, plans are formulated for the future covering *all* divisions of the business. From these plans each division of the business is directed and controlled whilst the work is being performed.

Management through accounts does not imply the setting up of elaborate and complicated systems whereby large quantities of stationery are used for the recording of statistics, or the employment of a large personnel or office equipment to operate the system. The modern method will eliminate much of the detailed routine that is usually carried on in most offices to-day, as many short cuts in costing, accounting, and general clerical routine will be made available. For instance, the control of production "on the shop floor" eliminates many of the details of cost finding. The control of sales in the field or the control of finance in the office will also provide equal opportunities for the removal of useless clerical operations and systems.

Two of the most important considerations in the installation of Management Through Accounts is the necessity of applying the method to the whole business, and not simply to budget for one or a few items only, and the fact that the active co-operation of the entire personnel is imperative for the satisfactory operation of the system.

To describe the modern method of Management through Accounts in all its details is impossible in a Dictionary, but the author will endeavour to cover all the main features so far as space will allow.

Management or Budget Committee. One of the first matters to consider is the organization necessary, and the formation of a Management or Budget Committee is usually one of the first moves in this direction. Management Through Accounts is an executive function, and it is only logical that the Managing Director should take full responsibility for the budget programme. Considerable detail is involved in the initial work of preparing budgets, and in the later routine of enforcing the budgets after they have been approved, and the formation of a Budget Committee, consisting of the Managing Director as Chairman and the heads of the major departments as members should be the first step taken.

Whilst the Managing Director is responsible for the entire budget scheme, the heads of departments will be responsible

for the enforcement of the budgets and should, therefore, be members of the Budget Committee.

Much of the detailed work of budgets will usually be delegated by the Managing Director to the Chief Accountant, or some other executive with the requisite training and experience, who should be known as the officer in charge of budgets. The duties of such an officer are many and varied, and much depends upon him for the smooth working of the budget routine. He will supply most of the information to the departmental heads and give them all the assistance required in the drawing-up of the estimates. He will also receive the completed estimates from all departments and present them to the Budget Committee, and convey all decisions and discussions of the Committee to departmental heads.

The chief function of the Budget Committee is to settle all differences of opinion and to approve finally all budgets.

With some concerns, a Budget Department is set up to handle all the details of the system, and in cases where this method is adopted one must avoid placing too much responsibility on the department as this may tend to relieve departmental heads of their responsibility for the enforcement of the budget. It is more satisfactory to form a Budget Committee of the officials who will be responsible for the carrying out of the budget programme.

Budget Periods. A very important item is the length of the budget period, and this must be decided upon before any of the preliminary work of preparing estimates is commenced. Concerns in different industries will adopt periods that are best suited to their business; likewise the smaller concern will need to decide its budget period on a different basis from that of the larger concerns. A budget period may be one, six, or nine months, or one year, or longer, depending upon the class of industry and size of the concern. Short periods are not suitable for concerns whose products, or processes are, or can be, standardized, as they will not allow production to be planned for a sufficient length of time to obtain the best results. Long-term planning is therefore the more desirable whenever it can be used. Many concerns engaged upon non-standard production have, in the past, chosen the short-term period when adopting a budget system, believing this to be the most suitable method for their special type of business.

Short-term methods are rarely successful, as short-term planning of sales has many objections. With the older form

of budgetary control, short periods were used to a much greater extent than long periods, for the reason that it was considered easier to forecast a few months ahead instead of a year or more. Modern planning and business forecasting has developed considerably, and many concerns now plan for future expansion and progress, for periods of two, three, or five years ahead. It must not be assumed, however, that a detailed budget is prepared for such long periods. Many concerns may wish to occupy a prominent position in a certain market, and in such cases the future is investigated and trends ascertained over very long periods before a programme extending over many years is embarked upon. When this long-term period has been fully examined, a budget period of a year is then adopted.

The extent to which a concern will explore any market will differ according to the nature of the products made and the resources available. Where expansion is to proceed slowly it may be sufficient to concentrate on the immediate periods or seasons and to budget accordingly.

Factors which affect the length of a budget period will vary with each business and definite rules cannot be given that will serve as a guide in all cases. Seasonal factors vary in each industry, and must be examined from many different angles. Some concerns may handle a variety of products, where one kind will offset another and so stabilize production throughout the year. In such cases seasonal peaks and valleys are counterbalanced and a steady rate of production maintained. Planning at least one year ahead is usually necessary in this instance so that a complete cycle of seasons can be included in the budget plan.

Where a concern has only one or a few products which can only be disposed of during one selling season, production may be carried on for a short period only and the budget period may then be short term and cover the period of manufacture only.

There is no fixed rule as to whether the production period or selling period should be the deciding factor. Some firms will "make to sell" whereas others will "sell to make." In the former case, production may be the basis for planning, and in the latter case sales may be the basis. Firms that make to sell will usually have a standard product, whereas those that sell to make will usually be engaged upon the manufacture of non-standard articles; for example, Foundries, General Machine Shops, Repairs, etc.

Sales Budget. The information which will form the basis of sales planning will naturally differ with each industry and the length of the budget period, but generally speaking one will first require full information regarding the general policy of the business. Details of sales over past periods and general information concerning market or trade conditions will come next in importance. Particulars of sales are readily obtainable from the accounting records, whereas market conditions may only be obtainable through research or by a special analysis of all information available. In some instances the information can be secured from an outside agency specializing in this class of work, or from the trade association of the particular industry.

The extent to which the record of past sales will be analysed is determined by the class of industry carried on. In most cases the information will be prepared under the following headings—

(a) By products or class of products. This information is useful in planning production and material purchases, etc., and in directing sales effort.

(b) By districts and countries.

(c) By branches and sub-analysed by salesmen as a means of controlling quotas and sales.

(d) By trades or class of customers.

Many other kinds of analysis are required by firms in different industries, and the above list is only given to illustrate the kind of information usually required. For instance, some concerns will prepare their statistics by showing both quantities and values together, whereas others will prepare a further analysis to those mentioned above based on terms of credit, such a statement being also used in planning the financial budget.

It is desirable that the Sales Budgets be prepared by the Sales Manager or his departments, and this is best accomplished by placing some of the responsibility of forecasting future sales on to the branch managers, who in turn will ask the individual salesmen in their territory to estimate their future sales. Some guidance will be necessary, and the Sales Department at Head Office should be in the position to gauge future market trends fairly correctly and give an indication of what is possible by suggesting quotas for each branch or district. Quotas should be fixed for each product or group of products and every assistance rendered to the branch managers and

salesmen to enable them to forecast their future sales on a reliable basis.

When first introducing Sales Budgets it is necessary that branch meetings of an educational nature be held and the objects and advantages of Budgetary Control explained to all salesmen. The complete co-operation of all salesmen is the first essential to successful sales budgeting and no concern should attempt Management Through Accounts unless its employees have been sold on the idea. In some cases a budget will be introduced by stages, and when this is done it enables the staff to become acquainted with the idea and its method of operation gradually. This method has many points in its favour, as it enables one to avoid much of the psychological effect that a new system will often create if the objects are not fully understood. By discussing the subject from all angles with individual salesmen, all objections should be removed and the road paved for greater co-operation.

The information and assistance given to branch managers and their salesmen will naturally vary according to the type, size, and peculiarities of each business and a great deal will depend upon the efficiency of the accounting and costing departments and upon the ability and effectiveness of the executive in charge of budgets. Much of the success of the estimates depends upon the ability of the chief budget officer to analyse all conditions which enter into the preliminary work of forecasting current and potential markets. The statistical and market information made available by the office departments should firstly be collected by the executive in charge of budgets, who, together with the officials directly responsible for sales, should study these reports, and think carefully and fully regarding future sales. Such co-operation will lead to a more efficient use of sales effort.

The estimates of sales must meet the needs of the factory departments and proper co-ordination must be achieved between these two divisions of the business.

The requirement of the Sales programme must be compared with the output capacity of the factory, due consideration being given to the dates upon which the quantities are required for delivery. With some industries the sales delivery periods will not be constant throughout the year, for example, in seasonal trades, and in others deliveries may be wanted in a more or less constant flow during the year. The Sales programme may also fall short of the plant capacity, whereas in other instances it may greatly exceed the capacity of the

present equipment. These and all other factors which will arise in the course of budgeting for sales must be investigated and the sales forecast adjusted so that the plant can be operated in an economical manner. Any readjustment of plant equipment to increase production should only be agreed upon if the Sales Departments are able to show that their forecast is reasonable and that there is every chance that the quotas set will be achieved.

With some companies the plant capacity is first obtained and from this estimate quotas are established for the Sales Department. This method simply reverses the above procedure where the Sales Departments firstly prepare their estimate and the plant is then requested to supply the necessary goods. In practice the effect is similar because the output capacity of the factory is generally determined in the first place after a study has been made of market conditions and of the volume of trade already being done. This method is usually adopted by companies making and selling proprietary articles supported by an extensive advertising campaign, for example vacuum-cleaners, refrigerators, patent foods and medicines, cosmetics, etc. The application of Management Through Accounts under these conditions is only undertaken after considerable research has been made into present and potential markets, as considerable capital outlay may be necessary as well as a great deal of force behind the sales division and its advertising campaign. Some very large concerns successfully operate on this basis.

Final approval of Sales Budgets must never be given until all other sections of the business have completed their estimates and the whole budget scheme has been fully discussed and examined by the Budget Committee. The Budgets of all sections of a business must dovetail with each other, the sales forecasts must therefore be considered in conjunction with the production, financial, and profit budgets. When a budget has been passed by the Budget Committee, it is desirable for the whole scheme to be submitted to a meeting of the Board of Directors for their final approval in order to give the budget its stamp of authority and approval. When the Sales Budget has been approved, it is returned by the executive in charge of budgets to the Sales Manager, who will be directly responsible for its enforcement. Branch managers should therefore be advised by the Sales Manager that their budgets have been adopted and they should inform the individual salesmen of the final quotas which have been set.

Variations between the budget and actual sales will usually develop and periodic statements must be prepared to give the necessary comparisons. In some cases the variations may be so slight that no change in the plans will be needed, but where the difference is great, consideration must be given to the cause and a suitable remedy discovered. Many concerns will vary their estimates to take care of the fluctuations which arise in the course of trading, but it should be remembered that the nature of a business and the scope of the budget system will decide whether this should be done. In the case of a business selling, say, proprietary articles, and supporting the sales organization with an extensive advertising programme, its budget of sales will be based on the principle that, given certain market conditions, a predetermined volume of sales should be achieved during the budget period. Under these circumstances variations to budgets should only be made to meet some very special situation. Failure in this case to make quotas over a reasonable period is more often due to some weakness in personnel, and suitable measures can usually be adopted to enforce the budget quotas.

The size and type of a business, its finances, and the general policy of the management must all be taken into consideration when deciding whether a sales budget shall be amended to agree with the general fluctuations of actual sales. Owing to the variety of circumstances that arise in connection with the sales of every company, it is impossible to deal fully with this particular matter in the short space available in a Dictionary. Concerns manufacturing articles of a general nature which are sold on a competitive market will find that fluctuations in the market price are one frequent cause of variation between the estimates and the actual sales, and this difficulty can be avoided by basing the budget on quantities for the purpose of fixing quotas for salesmen. The values of sales can be dealt with separately by the accounting department, and all fluctuations controlled and adjusted in the financial budget, or elsewhere as desired.

Unforeseen circumstances such as strikes, accidents, etc., may arise at times and an immediate revision of budgets may then be necessary. The modern and highly developed system of Management Through Accounts is designed to eliminate the revision of a budget once the quotas have been fixed. A master budget chart is prepared showing the cost of production, sales, and expenses, etc., and the gross and net profit earned according to the extent which the output capacity of the plant is

being used and the ratio of actual sales to the full plant capacity. By having photostats of the chart made periodically and plotting the actual production and sales vertically, one can visualize the variations and relationships without the necessity of preparing a large number of detailed statements or making drastic revision in the budget programmes.

Production Budgets. The chief problems to be considered in budgeting for production are, firstly, to ascertain the quantity or amount of each article or product that is to be manufactured during the budget period, and, secondly, to plan production on a basis that will guarantee the delivery of finished goods in accordance with the requirements of the Sales Budgets. Co-ordination of sales and production is therefore necessary and the planning department will require a complete copy of the Sales Budget on which to base its estimates.

If standard lines are made the amount of the Sales Budget will be adjusted by adding or subtracting the difference in finished stock between the beginning and end of the budget period. Budgeting of standard lines is comparatively easy but in cases where a concern manufactures both standard lines and for special orders, it is a good practice to reserve sufficient of the plant capacity for the standard lines. Budgeting for special orders is not always possible and full consideration must be given to any special conditions that will determine whether special orders or products shall form part of the budget scheme.

In planning production to meet the requirements of the Sales Budget a system of stores control must be in operation. With most industries it is impossible to forecast correctly the actual quantities of products that will be required each day, and a sufficient quantity of stock on hand must be carried to guarantee deliveries to the Sales Department. Production planning may therefore be largely a question of Stores Control.

In most engineering industries much of the work in connection with the Production Budget will fall on the planning department and drawing office, as they will have all data respecting the capacities of all machines and departments. Specifications covering each product, operation, or process will be prepared, and all detailed instructions made ready for the budget period. The work of production budgeting should be dealt with in two stages. Firstly, the main structure of the budget is prepared and submitted to the Budget Committee,

together with all other budgets. Secondly, after the Budget Committee have approved the entire scheme the detailed instructions covering actual manufacturing operations, etc., are then proceeded with. The actual procedure adopted will naturally differ according to the size and nature of each concern, but it will generally be found desirable to limit the Production Budget entirely to the question of production planning and to deal with materials, labour, and expenses separately—and by the joint efforts of the Costing Department and the works officials. The Cost Accountant should be made responsible for the predetermination of the total cost of all activities carried on under the budget system; the estimating of each element of cost therefore is dealt with under its respective heading.

Materials Budget. Material budgeting involves production, purchasing, and storekeeping, and full co-operation between all these departments is most necessary. The actual method of approach to the detailed routine of material forecasting depends upon the size and nature of the industry. Concerns manufacturing standard products may be able to employ short cuts in their methods if the products are made from one or two basic materials, as the relation between the total production and the basic materials used can be ascertained and the estimates figured on this basis. With most concerns, however, production methods will be well organized, and standard work instructions or standard material specifications used, and in such cases the exact quantity and kinds of materials used in the manufacture of their products will be known. Budgeting under these conditions will be chiefly a question of calculation. (See BILL OF MATERIAL.)

The amount of materials required must be ascertained from the production budget and an adjustment made to cover existing stocks and purchase commitments.

Purchases of raw materials and parts are controlled by an efficient stores routine, and minimum, maximum, and re-order points established. Materials should be ordered and delivered into stock as they are needed and every effort made to avoid the tying-up of excessive capital. The fixing of re-order quantities is therefore an important matter, and the use of a Stock Record Card similar to the one illustrated on page 414 will be found very useful.

The routine to be followed in preparing material budgets will firstly consist of listing all the items needed to carry out the Production Budget. From this listing the purchasing is

planned, and as adjustments will have been made in the production quantities to allow for stocks on hand, the final quantities shown for purchasing will be different. With some industries it is the practice to purchase certain materials according to seasons or for other reasons, and further difference will be shown between the two budgets. The work involved in preparing the Purchasing Budget should be carried out by the Purchasing Department in conjunction with the Planning Department and when completed should be reviewed by the Works Manager or other executive in charge of production, before being finally passed on to the officer in charge of budgets.

Labour Budgets. Whilst the Production Budgets will form the basis for calculating the Labour Budget in the majority of cases, many factors have to be taken into consideration when dealing with this section of a budget programme. The Production Budget is usually prepared showing a detailed analysis of all operations both for hand labour and machine labour and from this information the budget of labour costs can be ascertained with very little difficulty; but in cases where such detailed analysis of production is not feasible other methods of estimating must be adopted.

The policy of a concern in regard to its personnel will affect the method used, as some concerns operate on a basis that will keep their workers regularly employed throughout the year, whereas others will vary their pay roll to suit the budget programme. In the former case the total wages paid either by trades or departments, and as shown by the wages records, will be used as a guide when estimating, but in the latter case a more accurate method must be found.

Many of the objections raised against the old form of Budgetary Control nearly always arise from the fact that a concern is using a system of budgets that is only applied to a part of the business and is based on estimates that have been prepared in a very rough and ready manner, the general belief being that too much detail and expense is involved in approaching the subject in a scientific manner. Systems are in use at the present time that are confined to the estimating of costs and sales, in totals; such methods are very satisfactory for the small concern and for certain of the larger companies, but the method is not Management Through Accounts as described in this article, and it should be referred to by another name.

In the case of labour estimates, therefore, every effort should

be made to budget for the period by adopting a method that will give good results. Labour estimates should always be based on the Production Budget where operations are standardized. Management Through Accounts is a method for controlling operations, and unless this can be accomplished all the work and expense of preparing a budget is lost.

Labour Budgets should show the hours and trades of direct labour only, together with any other information needed, and when the budget has been completed, it is handed to the Cost Accountant or pay roll department for extension of values and totals which will be shown per day, week, or month, according to system.

Indirect Labour is best dealt with by the Cost Accountant when compiling the Expense Budgets, but if it is desired that it be included with the Labour Budget, it will be necessary for the Cost Accountant to be consulted and the work completed with the close co-operation of the two departments.

The Labour Budgets, when complete, are passed to the officer in charge of budgets for the consideration of the Budget Committee.

Capital Expenditure Budget. The plant and equipment needed for the Production Budget require careful consideration, and the subject is generally dealt with under three or more headings, namely, Repairs, Maintenance, and Additions. The Repairs and Maintenance will mainly become a question of estimate by the plant engineers, who will be guided by the requirements of the Production Budget and previous costs of Repairs, etc., as shown by the system of Service Orders. The Completed Budget is then passed on to the Cost Accountant to be included in the factory expense budgets.

The budget of additions to plant will form part of the Financial Budget, for the reason that the cost of new plant is a capital investment. The plant engineer and the production engineer will co-operate and jointly prepare the estimate of any new plant required. New plant may be an addition or a replacement of an old and obsolete machine, and in the latter case the necessary adjustment in the plant records will be made.

The budgeting of plant and machinery has many advantages, as it not only tends to keep the equipment in perfect order, but safeguards the company against the unprofitable investment of its funds in equipment that may quickly become obsolete or idle through insufficient work. Long-run planning is usually adopted, as any new machines or equipment required

must be considered with the general growth of the business as well as the present needs as indicated by the production programme. It will be observed that the Production Estimates form the basis upon which most of the forecasts are prepared under the entire budget system.

Repairs, alterations and capital expenditure affecting other assets, etc., such as furniture, buildings, and office equipment, will be dealt with in a similar manner to the above by the departments interested.

Establishment Expense Budgets. The budgets concerning expenses will be prepared by the Cost Accountant from information contained in the various budgets which have been submitted up to this point. The procedure to be followed in this case is slightly different from that described under the heading of ESTABLISHMENT EXPENSE on page 153, where ordinary cost finding methods are discussed and expenses estimated from past records and without the aid of a Production Budget. In dealing with Management Through Accounts, the expenses are estimated on the basis of a production and sales programme, and the methods must be adjusted accordingly. Reference should be made, however, to "Establishment Expense," and particular note made of the advantages and disadvantages of the three methods discussed. It is also important to note that, whilst all estimates are based on a definite sales and production programme, one must not overlook the fact that if the programme does not make use of the full normal output capacity of the plant, that this condition must be clearly shown in the cost records.

The treatment of expenses will fall under two main headings. Firstly, the preparation of the estimates to cover the budget system, and, secondly, the recovery of expenses in Costs. To estimate expenses from the budgets already prepared is fairly simple if a business is efficiently organized and proper records available, as most of the necessary information will be provided by the costing, purchasing, and wages departments. Many technical points will arise, but all of these are a question of costing procedure and each has been dealt with under its appropriate heading in the DICTIONARY.

It is desirable that the estimates should be prepared under three main divisions—

1. Sales and Distribution Expenses.
2. Factory Expenses.
3. Administrative Expenses.

The individual items that go to make up the total of each

of the above headings should be shown separately in the estimates to enable the control of expenditure to be more easily effected. Sales Expenses should be analysed to show separately the cost of advertising when large sums are being spent in this direction, or a separate advertising expense budget should be prepared by the Advertising Manager.

Where a concern has branch offices it is often desirable for branch managers to be requested to prepare an estimate of their expenses at the time they are dealing with the Sales Estimates. This method has many advantages. A branch manager should be consulted when his standards are being set, as this helps a great deal in the enforcement of the budget system.

When this procedure is followed, the branch estimates are reviewed by the Sales Manager, and if any revision is necessary the branch must be advised and reasons given for the change.

The main items that comprise the Sales Expenses should be estimated by the Cost Accountant and the Sales Manager jointly, as many of the items will be affected by the sales policy of the company. Branch office estimates are combined with the estimates prepared at Head Office and the final Sales Expense Budget is then reviewed by the General Sales Manager or other officer responsible for the enforcement of this particular budget.

The actual routine to be followed in the preparation of Sales Expense Budgets will naturally be a matter for each company to decide, but it is desirable that Sales Expenses be dealt with at the same time as all other Expense Budgets, otherwise difficulty may be experienced when summarizing and balancing the total Expenses Budgets and in drawing up the Financial budget, etc. Cost Accounting routine must also be kept in mind and nothing done that will conflict with the principles already established in regard to the treatment of expenses generally.

Factory Expense Budgets should be suitably analysed and the items grouped according to their incidence. The complete schedule must be drawn up in a manner that will facilitate the control of expenses by frequent comparisons between the estimated and actual. Factory Expenses are dealt with differently by almost all businesses, and orthodox costing routine should not be confused with Expense Budgets. Most costing systems will record the actual expense whilst the work is in process and so provide a means of comparison with the estimates in detail, but in dealing with budgetary control of

production the main object is to set a maximum time or cost at which an article or process shall be produced, and to force the accomplishment of this objective by a system of control *at the centre of production*. The problem therefore is, firstly, the control of expenses expressed in amounts or values, and, secondly, the control of manufacturing in units, which may be the article, process, or operation, or period of time taken in completing a given task, or a combination of the two. In the case of Factory Expenses the control of amounts is relatively simple if the estimates are drawn up in a manner that will provide easy comparison with the actual expenses as shown by the financial or cost accounts, and if the items are suitably analysed by departments or sections to coincide with the division of responsibility in the plant.

Variations between the actual and estimated expenses will be recorded in the system, but it is not desirable that budgets be amended unless some unforeseen circumstances arise which compel an entire revision of the system. Variations are more easily and effectively dealt with as an adjustment to the comparative statements, which should be prepared at frequent intervals.

Factory Expense Budgets are usually prepared from the information supplied by the cost accountant and in co-operation with the heads of the departments concerned. The completed budget should then be submitted to the Works Management for approval before being passed on to the officer in charge of budgets.

The Budget of Administrative Expenses is the joint responsibility of the Cost Accountant and the Managing Director. Expenses should be summarized on a departmental basis to conform to the division of responsibilities of the Administrative Departments. Control of expenses must be enforced in the office if the entire budget programme is to be successful, and each departmental head should therefore be given an opportunity to assist in the estimating of their expenses.

Financial Budget. The Financial Budget is the final step in the preparation of the estimates, and its object is to provide an estimate of cash receipts and disbursements for the budget period and to serve as a guide in planning the finances of the company. Financial planning will follow the general scheme of budgets and if long-term planning has been adopted for Sales and Production, all financial requirements will be estimated accordingly. Short-term planning of finances is not the most satisfactory method to use under any scheme of budgets,

and in cases where Sales or Production have been dealt with on a short-term basis it is desirable that the financial side of the programme should be examined from the point of view of long-run planning. Short-run planning will chiefly comprise the balancing of anticipated cash receipts against the anticipated expenditure for a short period, whereas long-run planning will take into full consideration all items of capital expenditure.

The Financial Budget depends upon all the other budgets for most of its information and is practically a financial summary of estimated revenue and disbursements. A great deal of re-analysing is, however, necessary before the final *Form No. 56.*

FINANCIAL SUMMARY				
FOR BUDGET PERIOD ENDING				
	January	February	March	Etc.
Bank Balance at beginning of period				
Cash receipts during month				
Cash disbursements during month				
Bank Balance or cash shortage				
Overdraft Required				

estimate can be completed. The budgets prepared up to this point will indicate the general source of income and expense, but no record has yet been made of the sundry or miscellaneous items of income, such as cash sales of sundries, scrap sales, etc., or of the miscellaneous items of expense such as interest on overdrafts or bills payable, etc. The financial officer of the business must therefore prepare his estimates of these items. Many concerns will omit miscellaneous income from their budgets, although this is not a good plan to follow. However, it is recommended that miscellaneous items of expense should be included.

The necessity for financial planning will be obvious to most business men. The average business of to-day is operated upon

a close margin of working capital, and a company may frequently call upon bank its to provide any necessary funds during certain periods of the year. It is essential, therefore, that the periods of borrowing should be known well in advance, so that arrangements can be made to guarantee that the funds required will be available.

The preparation of the Financial Budget will be the responsibility of the financial executive with the assistance of the officer in charge of the budget system. All the budgets prepared up to this point will be in the possession of the budget officer, and from these the estimates of cash receipts and disbursements will be compiled and a financial programme drawn up for the consideration of the budget committee.

The estimate of cash receipts will be based on the Estimate of Sales and the exact procedure to be used will depend upon the nature of the business. In many cases, however, the estimates will show the amount to be collected each month during the budget period from the sundry debtor accounts, Bills Receivable, and Cash Sales. With some concerns the sundry debtors accounts will need to be analysed by class of customers or on some other basis to provide the due dates of accounts, etc.

Funds required to meet cash disbursements will be estimated from all the budgets excepting the Sales Budget. Separate estimates should be given for each budget and the statements drawn up in a manner that will facilitate comparison between the estimated and actual disbursements.

From the above estimates there should be prepared a final summary showing the financial requirements for the budget period. These summaries show the estimated cash receipts and disbursements, bank balances, and the plus or minus figure at the end of each month. Forms for this purpose should be ruled to show this information similar to the specimen form No. 56.

The Financial Budget, when completed will be passed on to the officer in charge of budget procedure and after it has been considered and approved by the Budget Committee, it becomes the financial programme of the company.

Budget of Profit and Loss Account and Balance Sheet. An estimated Profit and Loss Account and Balance Sheet is the final step in the process of budgeting and these statements will enable the directors and other executives to see the effect of the complete scheme and to decide whether the programme

as presented is desirable or whether modifications are necessary. If the scheme is approved, the necessary financial arrangements will be completed and the various budgets will then become the programme of operation for all manufacturing, sales, and office departments.

In drawing up an estimated Profit and Loss Account, all the estimates will be used and the figures of each transferred to the summary. Some concerns will prepare a Cost of Sales Account in place of the ordinary Profit and Loss Account, and to show the estimated gross profit on sales as a credit to a condensed form of Profit and Loss Account.

The total estimated sales for the budget period should be adjusted to allow for returns and allowances if this item has not already been shown in the sales budget.

To estimate the Cost of Sales one will use standard costing routine and utilize the figures of the production, materials, labour, and expense budgets, etc.

The preparation of the Estimated Balance Sheet should not present much difficulty as the various assets and liabilities can be estimated by taking the previous Balance Sheet and adjusting the figures from the information contained in the various departmental budgets.

Estimated Profit and Loss Accounts and Balance Sheets should be drawn up to show a comparison with the previous year's figures.

Control of Budgets. A series of budgets without the effective control and the means of enforcing them, is useless and a waste of time and effort. No concern should attempt Management Through Accounts unless they have the organization and the will to force the programme in all its details. The method employed to enforce all programmes is very important and serious attention must be given to this phase of the system before any final decision is arrived at. A company must be well organized, and its administrative and departmental heads must have initiative and vision; without all these qualifications satisfactory results cannot be achieved.

Control and enforcement of budgets becomes the major objective once the estimates have been approved by the Directors and their decision handed to the Budget Committee. The officer in charge of budgets is the pivot on which all the details of the budget procedure revolves and much of the success of the system will depend upon his ability to deal with such an important administrative function. The actual enforcement of the budgets is the direct responsibility of the

departmental heads, and they should be supplied with reports showing the progress they are making. The Budget Controller will be responsible for the preparation of these reports showing what has been accomplished against the estimates, and in cases where the actual performance is falling below the estimated, intelligent advice must be given.

Reports must be made promptly and at frequent intervals, which will vary with different departments. In the case of reports for the Sales Executives, these may be prepared daily, weekly, or monthly, according to the nature of the business and the standard of control that is needed. In the majority of cases weekly reports will be the most desirable. The amount and kind of analysis shown on reports will also be determined by the class of business.

Production reports will usually be made up to show the actual production in units or number of articles, etc., with a separate statement showing any fluctuation in manufacturing costs, together with sufficient explanation. With a well-organized business, the reporting of actual detailed costs against the estimated is rarely needed excepting for isolated cases, and a saving in clerical effort is thereby made.

Material and labour costs should only be reported in totals if the production reports show that the actual production is well within the budget. Variations in materials consumed and labour used is an important item and its reporting should be made very frequently.

Expense Reports should only be required in a summarized form showing the plus or minus over the estimated and the reasons for the difference. Most concerns will prepare expense reports monthly, finding this to be the most convenient owing to the difficulty of controlling certain expenses on a shorter period.

Owing to the wide variation in the detailed methods of all businesses it is impossible to give specimen forms of reports that would be suitable under all conditions, but sufficient information has been given to enable the Cost Accountant or Budget Controller to design forms to suit his own requirements.

Revision of Budgets. Many different opinions exist as to when and the extent to which a budget should be revised during a budget period. Conditions vary so much between companies that it is impossible to deal with the subject in a manner that will satisfy all points of view and meet every condition. If it is considered necessary to revise constantly a

budget it can be taken for granted that the scheme was badly framed in the first place or sufficient consideration or research was not given to some important phase of the business. It may also be due to the fact that the business was not organized on a basis suitable for budgets, as in the case of a company organized on a basis where responsibility has not been properly delegated. Constant revision must be avoided otherwise the system will become too cumbersome in operation. There are many factors that will affect budgets and which cannot be foreseen at the time the estimates are first drawn up, such as strikes, accidents, etc. These factors will call for an immediate revision, but the small and unimportant differences that will arise almost each week should not be allowed to interfere with the existing budgets; adjustments in the weekly or monthly statements and reports will effectively deal with these items.

Improvements in methods or procedure will be discovered and adopted, and if these should materially alter the costs then an adjustment in the detailed budget may be desirable. Improved processes that affect the cost very little are best dealt with by showing an adjustment on the periodical reports.

The application of Management Through Accounts in the manner described above has produced results far beyond the expectations of many business men and has been the means of effecting expansion and consolidation of different companies in highly competitive fields. The complete scheme of Management Through Accounts has been applied in all its details and has repaid its users many times. The owners of a business, whether small or large, who feel that a trial should be made in the first place, should not attempt to apply the highly developed method described above, but should adopt the modified form, namely, Budgetary Control, and prepare their estimates by totals or groups of expenses, etc., and then concentrate on the enforcement of the budgets. A budget that is not, or cannot be, enforced or accomplished is a waste of time.

MANUFACTURED GOODS—REJECTION OF. The routine involved in connection with the recording of rejections or spoilt work will not only vary with the class of trade that is being carried on, but the volume of output, class of labour employed, and internal production methods will demand that each concern within an industry must have its special method.

For the purpose of collecting and tabulating the cost of rejections, the "rejection note" issued by the Inspection Department or view room may, in the majority of cases, form

the basis of compiling this record, but here again, the nature of the industry may be such that a rejection note is unnecessary.

In the manufacture of electric lamps, for instance, the

Form No. 57.

SEND THIS COPY TO PLANNING DEPT.	REJECTION NOTE	Credit <small>ADVICE NOTE No.</small>
	DATE	Works <small>ORDER No.</small>
	REASONS FOR REJECTION—	
	RETURN GOODS TO 	REJECTED BY

rejects are thrown out at the end of each operation or process and the record appears on the "control," a form similar to the work ticket of an engineering factory, excepting that all the processes are shown thereon. On the other hand, certain operations in an engineering works are recorded on the job

card or work ticket, which also has spaces for noting the quantities good and rejected. It will, therefore, be seen that the problem of costing spoilt work or rejections is one that can only be dealt with in general terms.

Most systems of costing must provide for the recording of spoilt work at the completion of the individual operations, and this can be effected in a variety of ways ; for instance, if the piece work or bonus methods of payment be used, this record can easily be obtained from the job cards or work tickets according to system, but with the process industries the amount of spoilt work or rejects may not be ascertainable until the end of a period such as a week or month, etc.—the period depending upon the length of time it takes to complete the process. In such cases the amount of rejects will be obtained from the Process Cost Account, and it may be represented by the difference between the total materials put into the process at the beginning of the period and the net amount taken out at the end of the period. On the other hand, the process may be such that other losses will occur during manufacture as, for instance, losses due to evaporation and conversion, etc. The amount or value of spoilt work could, therefore, only then be ascertained by actual counting or weighing of the defects.

The recording of defective or spoilt work during process of manufacture is extremely difficult, and great care must be exercised in devising any system for this purpose, otherwise a considerable amount of duplication of clerical work will result. As a general guide in this direction, however, one may safely weave the system with the method of inspection and viewing, also booking time to jobs (if day rate method of payment is not used), as the point of inspection will invariably provide the desired information.

The inspection of the *completed* article, however, provides an easy means of collecting statistics in regard to defects or spoilt work, and in those industries where the article produced is capable of (and requires) individual inspection or test before being placed in the finished stores, the use of an "inspection certificate," ruled similar to the specimen given under its name, will generally be employed as a means of notifying the departments concerned that the particular goods have passed final inspection. Such a certificate also serves the purpose of advising the Cost and Planning Departments when all work on the production order is completed.

With regard to the rejection of those articles which do not

come up to the desired standard, a "rejection note," ruled similar to the specimen given, will be made out in place of the inspection certificate, and the copies thus distributed—

First copy may be attached to the rejected article and for this purpose may be in the form of a tie-on label.

Second and third copies sent to Planning Department.

Fourth copy may be provided for the Inspection Department, and will serve as their permanent record.

The object in sending two copies to the Planning Department is to enable them to notify any other department concerned. This method is to be preferred when the Sales Department only require notification that certain goods have been rejected, and the Stores Department of general stock items. On the other hand, neither of these departments may be concerned with the particular rejection, and in such a case the Planning Department will deal with the matter accordingly by sending the copy to the department interested.

The recording of rejected goods in the Cost Department is important, and a copy of the rejection note may be provided for this department; alternatively, the planning copy can be passed to the cost office, who will note on their records that a certain item has been rejected.

With some industries the nature of the articles produced may be such that they will not lend themselves to rectification, and the rejection will then be treated as a total loss. In other cases the cost of rectifying, etc., will be recorded in the cost accounts by either of the following methods—

Standard Stock Items. The cost of rectification should be charged to a special service or standing works order suitably analysed to show the cause of the expense. A reject may arise through faulty design, faulty workmanship, faulty materials, or unsuitable production methods, and the analysis of the service orders may be arranged accordingly, as also to show the cost incurred in each department.

Special Articles Made Against Customers' Orders. The cost of rectifying faulty goods made to a customer's special order should be charged to the production or works order on which the articles were originally made, as the object now is to collect all the information relative to the cost of the particular item, so that sufficient data will be available in case a repeat order is received and a revised sales price is to be quoted.

The actual treatment of the cost of defective goods will naturally differ according to the size of each concern and the value of such defects over a period. The small concern may

not require the expense analysed to the same extent as the larger concern. In either case, however, the system of "service orders" will usually form the medium of collecting all expenses in this direction. (See also INSPECTION CERTIFICATE, WORK TICKET, also GOODS RECEIVED—REJECTION OF.)

MANUFACTURING COST. (See FACTORY COST.)

MANUFACTURING DEPARTMENTS, or productive departments, may be said to be the natural process divisions of any business, and, as the qualification infers, cover direct manufacture. There are three elements of expenditure in any manufacturing department, viz.—

1. Labour, being direct wages paid.
2. Materials—used in direct manufacture.
3. Factory expenses.

(See also DEPARTMENTS.)

MANUFACTURING EXPENSE. A term frequently used when referring to the indirect expenses of a factory, which consist of all charges other than direct labour or direct material. (See FACTORY EXPENSE.)

MATERIAL ADJUSTMENT ACCOUNT. (See COST CONTROL ACCOUNTS and PRICING STORES REQUISITIONS—METHODS OF.)

MATERIAL ALLOCATION CARD. (See STOCK RECORD CARD.)

MATERIAL CONTROL. (See COST CONTROL ACCOUNTS, and STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.)

MATERIAL COST COLLECTING SHEET. A form on which the detailed amounts of materials are summarized in order that the total material cost of a job, order or process can be ascertained. The use of such a form is usually confined to those industries where the works or production order covers a large quantity of articles, or where a considerable number of items require summarizing before the material cost of a works order can be completed. The extent to which material collecting sheets can be used and the form of ruling depends upon the method of cost finding, nature and size of the business, and the amount of information required by the management.

For instance, if bills of material are in use, a material collecting sheet will rarely be necessary, as the summarizing of the materials consumed can then be made upon the bill of material, but in those cases where this procedure cannot be followed, the material collecting sheet will often be useful,

especially when it is desired to ascertain the value of materials consumed on a part finished order.

The procedure to be used in writing up the material collecting sheet will naturally depend upon the routine of the Cost Department, as the cost of an order may not be compiled until all the work on the order is finished. In such cases the stores requisitions, when received by the Cost Department, are sorted and filed according to the works or production order number, and upon being notified that the order is completed, the whole of the stores requisitions may be summarized with the aid of an adding and listing machine, and a final total obtained by the one operation.

With such a method in use, a material collecting sheet will not be required, but in those cases where it is the practice to summarize the value of materials issued against each order each week, provision must be made for collecting the weekly amounts.

The specimen material collecting sheet given is used with such a method. The date of the week is entered in the left-hand column, the total quantity and value issued for that week inserted under the "issued" column, and the total "to date" then ascertained and extended in the third column.

When the value of materials used on an order is collected each week in the above manner, it is desirable that the day of the week should coincide with that used for labour collecting sheets. In other words, the date of the pay week should be used in both cases.

MATERIAL REQUISITION. A term occasionally used when referring to an order on the storekeeper to issue certain goods for use in the works, also as advice to the buyer that certain materials are required and that they must be purchased. The term "material requisition" should, therefore, never be used unless qualified in some particular way as "material purchase requisition" or "issue requisition."

The terms "purchase requisition" and "stores requisition" are to be preferred.

MATERIAL SPECIFICATION. (See BILL OF MATERIAL.)

MATERIAL SUMMARY. (See MATERIAL COST COLLECTING SHEET, also COST SUMMARIES.)

MATERIAL TRANSFER NOTE. (See STORES TRANSFER NOTE.)

MATERIALS—CLASSIFICATION OF. In manufacturing,

businesses materials—forming the basis of manufacture—comprise the greater portion of expenditure. Manufacturing might be termed as the art of making changes in the substance of material by the application of labour and machinery. Alteration to, a combination of, or the reconditioning of material are the chief functions in manufacturing, and the aim in factory cost is concerned then with the determination, in detail, of the cost of production of all articles, processes, alterations, etc.

There are various kinds of changes performed in material, viz.—

(a) When material remains the same as purchased, nothing being added to or taken from it, except the possibility of waste caused by deterioration, shrinkage, etc., the materials being changed in form or size.

(b) It may be split up in the process of manufacture, and various by-products extracted from it.

(c) It may be added to other different materials in the course of manufacture, or combined with the same material in some other form or substance.

In manufacturing activity one is concerned generally with materials under the following headings—

1. Raw materials and components required for actual manufacture.

2. Materials required for the manufacture of goods to customers' special requirements.

3. Sundry expense or indirect materials, machinery, and spare parts for repairs and renewals to plant, fuel, oil, coal, petrol, grease, packing materials, etc.

The materials referred to under 1 and 3 might be termed as general stock materials, meaning that constant and adequate supplies must always be kept in stock to meet the demand covered by the general policy pursued in the course of manufacture in the factory concerned.

Regarding materials under 2, viz., those required for the execution of customers' special orders, they can be defined as follows—

(d) Raw materials and partly finished goods on which further labour and machining have to be expended.

(e) Materials or goods resold to customers in the same condition as purchased by the manufacturer.

(f) Sundry indirect or expense materials such as tools, spare parts, fuel, etc.

In the case of (d) and (e), these materials would be purchased

as and when the demand necessitated, and the question of adequate supplies would not apply under these headings. Concerning (f) (sundry indirect or expense materials), these would be drawn from the works' general supply.

Correct classification of all materials purchased is of paramount importance, and the accountancy involved will obviously be complex, or simple, according to the amount of details that it is desired to record.

With many concerns the nature of the trade carried on will be such that a more detailed classification than that given above will obviously be required, but owing to the great diversity of methods and kinds of materials used, etc., by the respective firms, no form of classification can be given that will be suitable under all conditions.

The broad groups given above, into which materials may be classified, will, however, be sufficient to indicate the general principles underlying the work of material classification, and any sub-classification will be determined by the conditions that prevail at each factory. For instance, with some concerns the nature of the business carried on may require that the raw materials and parts used for actual manufacture (group 1) will be further analysed as—

- (i) Raw materials :
- (ii) Bought out supplies ;

and each of these subdivisions analysed either according to the class of material, such as brass: bars, sheets, etc. ; copper: bars, sheets, etc. ; steel: high speed, tool, etc. Alternatively, the main subdivision may firstly have regard to the form or shape, and secondly, the class, i.e. bar metal, brass, copper, etc., sheet metal, brass, copper, iron, etc.

With regard to (ii), the definition given to parts or bought out supplies is found to differ in practically each case, as some firms will regard, say, screws, washers, nuts, and bolts, and various other kinds of ironmongery or hardware, as raw materials, whereas others will classify such items as bought out supplies. The latter classification is the more correct if work is not done *on* the actual items in question. Such parts as screws, washers, nuts, bolts, and the like will usually be *assembled* on the product and, whilst they may be regarded theoretically as "raw" materials, they differ considerably from that class of material which is formed or shaped into the desired article. From both a costing and manufacturing point of view, a clear distinction must be made between such

classes of materials, otherwise valuable information will be merged with other figures which really have no inter-relation. With some concerns, for instance, the total "raw" material consumption over a period may appear to represent a fairly substantial amount of production, when compared with other data, such as the direct wages paid, etc., but if the item of raw material were to include only such materials as are worked upon for the specific purpose of changing their form or shape, or combining with other materials in order to produce a saleable product, and were all such items as washers, rivets, screws, bolts, nuts, and the like classified as bought out supplies, a very different statement for comparative purposes might result. In such a case the comparison of the respective totals of the two classes of materials consumed would obviously require that the direct labour be analysed to show the amount spent on assembling and fitting, etc., as distinct from the labour performed on the purely manufacturing processes.

The distinction usually given to materials for purely costing purposes, namely, direct and indirect materials, will not necessarily affect the basis of material classification now under consideration, because many of the items which will be included in group 1 above will be drawn from stores for use on service or standing works orders in addition to those materials that comprise group 3. The quantity or value of indirect or expense materials consumed during any period will, therefore, be ascertained through the system of service orders, which can be arranged to give such further classification as may be found necessary. (See also CLASSIFICATION OF ACCOUNTS and CLASSIFICATION OF COST.)

MATERIALS CONTROL ACCOUNT. (See COST CONTROL ACCOUNTS, also STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.)

MATERIALS—METHODS OF PRICING. (See PRICING STORES REQUISITIONS—METHODS OF)

MAXIMUM OUTPUT—BASING EXPENSES ON. (See ESTABLISHMENT EXPENSE.)

MAXIMUM STOCK. The term used when referring to the maximum quantity of stock that should be on hand at any time. The fixing of a maximum stock sets a justifiable limit to the amount of stock which should be on hand.

In conjunction with the maximum stock there will always be used a minimum stock, being the quantity below which the stock must not be allowed to fall.

For details as to the fixing of maximum and minimum

stocks, also the object of operating stocks upon a minimum-maximum basis, see MINIMUM STOCK.

MECHANIZATION OF ACCOUNTS. The tremendous advance in the development of accounting machines, particularly during the past ten years, has enabled the mechanization of costing and general accounting to proceed upon lines that have revolutionized the costing and accounting profession. To disregard this new mechanical aid and continue to design and operate systems on the "pen and ink" basis places any cost accountant and his employer at a serious disadvantage.

Manufacturing concerns have been fully alive to the opportunities afforded them in this machine age; they have studied labour-saving machines and have aided in the design of machines to meet the most exacting requirements in the various processes of manufacturing. A machine which has been designed for precision work and high production is not simply turned over to the mechanic selected to be its operator; he is first thoroughly trained in its operation, and after completing a most thorough training, in which rhythm of operation has been developed and every useless motion eliminated, he becomes the master, not the slave, of the machine. Production standards have then been established and the new machine placed under systematic production and efficiency control. We therefore may well pause in wonder as we watch modern machines in operation, accomplishing the seemingly impossible tasks with a degree of perfection and precision which a few years ago was declared to be the impossible.

Management in the past has been vitally concerned in attaining the ideal in mechanization of the factory. Newer and better machines have been installed to turn out a more perfect article and in greater volume, and so increase sales. In the course of this pressure to attain their ideal in factory output at a competitive cost, management failed to realize that the output of the office is an equally important consideration in relation to profits.

The modern office of to-day is one that is mechanized upon similar principles to the plant, and the cost accountant, in his approach to the study of mechanization, might with advantage take a walk through a model factory of to-day, with the thoughts of the previous paragraphs in his mind, and accept what he sees in the mastery of producing machines as his challenge to the office of "to-morrow."

In considering the mechanization of accounts, it must be borne in mind that mechanization does not mean simply

posting a ledger by the aid of a machine. Ledger posting, or book-keeping, was the extent to which "book-keeping" machines were used in the old days and any concern which could claim machine posting of its ledgers was regarded among the efficient and up to date. Conditions have changed a great deal during the past few years and the many improvements in accounting machines of all types have completely revolutionized the subject, with the result that in modern systems ledger posting is now only a by-product of other and more important operations in the machine process of modern costing and accounting.

The ideal machine installation of to-day is one around which are built the ideal working conditions, in which the maximum production is maintained with the minimum of manual and mental effort and with all drudgery eliminated.

Cost accountants should have a thorough knowledge of all types of office machinery and a complete understanding of their uses, limitations and advantages, and be able to discuss with facility the relative merits of the various types and makes of machines. A great deal of practical experience of accounting machinery will be required before one can do this, but this should not prevent the student or business executive from making a study of the subject from the written information available.

Mechanization of an office does not necessarily mean that a machine is employed for the posting of a ledger or the entering of a journal. Single-purpose machines should be avoided excepting in cases where a very large volume of entries have to be made and a balance obtained at the end of the process, such as with Sales Ledgers, etc., and all other kinds of ledger posting is best arranged as a "by-product" of other processes in the general routine, and when this is accomplished the full advantage of accounting machinery with its large economies in the cost of operating an office will be achieved.

The subject of mechanization of an office cannot be dealt with in complete detail in the limited space available in a Dictionary, but sufficient information will be given to enable one to understand the fundamentals of this subject and of the various types of machines available.

No attempt will be made to list all the different makes of machines, preferring rather to classify the wide range of accounting machines available according to their various types and to describe briefly each of these groups.

The thought behind the treatment of this subject is to

encourage the cost accountant to make an intensive study of the different types of machines that he may be enabled to make an intelligent study of their application to the individual problems which may confront him from time to time. Each of these accounting problems requires an intensive study, and to aid in this investigation it is suggested that the first thought be given to the general style of the machine which should receive special consideration for the immediate problem.

For the purpose of consideration, accounting machines may be divided into two main groups according to types. The first group comprises machines with typewriting facilities and the second group are without typewriters. Both of these groups are subdivided into (1) machines with a full keyboard, and (2) machines with ten or twelve keys only.

A brief discussion of the above types follows, and no attempt is made to cover the many different makes of machines, but to give sufficient information to indicate general variations between types only. In describing the various types it will be necessary to use technical terms to describe special features or attachments and a summary of the more general terms will be given firstly.

The Crossfooter. This is the main accumulating section of the accounting machine. The term is applied to distinguish between the total accumulated for the individual line of posting across the page, i.e. the crossfooter, and the totals of the vertical column postings, which are generally referred to as Registers. In ledger posting, the crossfooter accumulates the old balance, plus debit postings, minus credit postings and creates the new balance; and, further, proves the pick up of the old balance: in other words, a line proof.

On a wide analysis sheet the crossfooter may be used to best advantage in the accumulation of all debit postings and the subtraction of all credits. In some instances manufacturers so construct the machine that if the crossfooter is not clear at the completion of the individual line, the mechanism will not function on the succeeding line. In other cases the crossfooter will print a clear symbol at the completion of the line, this is commonly referred to as "Line-Proof."

More frequently still the crossfooter is used in the posting of a ledger account which is inserted over a proof or journal sheet and is utilized for building up the new balance on the account as suggested above, the journal maintaining a complete carbon record of all postings together with an original

type impression of such other distribution on the journal as may be required.

Registers. Sometimes also referred to as Totalizers, Accumulators, Counters, Adding Boxes, etc.

These are individual adding machines built into the accounting machine or in other machines, adding attachments located on the carriage, and are used for the accumulation of *vertical* columnar totals. For the column work, these registers are usually selected by the location of the carriage.

On some machines there are two other methods of register control—

(1) "Keyboard Selection of Registers," where from one to approximately thirty registers may be selected from a corresponding register key on the keyboard.

(2) "Column Selector." On these machines the keys for the amount are first depressed on the keyboard, then a key located just in front of the column in which the amount is to be recorded. The depression of that key causes the carriage to first tabulate directly to the required column, selecting also the active register, recording the amount and adding it in both crossfooter and register.

Automatic Column Tabulation. Where machines are constructed with automatic tabulation, the carriage will tabulate automatically to the next column following the recording of an amount. Without this feature, it is necessary to manually depress the tabulating key to move the carriage from column to column.

Skip Tabulation. With this feature it is possible to select definite columns by the depression of a special motor-bar which causes the carriage to tabulate through the columns preceding the one in which an entry is to be made.

Figure Tabulation. This feature is confined to the typewriter accounting machines in which the amounts are recorded from the typewriter keyboard. On such machines, it is necessary for the operator to depress a tabulation key for the required denomination, the key for thousands carrying the machine into position for the typing of the digit in the thousandth position. The unit tabulator would tabulate the carriage four positions to the right for units.

Collation of Forms. Practically all accounting machines are now built to handle three or occasionally more forms collated so that the distance from their respective form headings may vary in proportion to the number of preceding entries on each and yet when the posting has been completed and the form

removed from the carriage it would be difficult to determine whether the numerous postings on each form had been made at one time or in separate operations each day. Usually one of these forms, most frequently a proof sheet, is wound around the platen with carbon paper above it and the other forms are inserted under it, the pressure rolls dropping away from the platen to permit free insertion of forms. Alignment guides on the carriage indicate the printing line and also guide the forms accurately to ensure perfection of printing in respect of preceding postings.

Front Feed Insertion. This is a fast method of inserting forms in an accounting machine. With this plan, the proof sheet (when used) is usually wound round the platen as described above, pressure rolls holding it firmly in position, while others arranged for the narrower forms drop forward when the carriage is open, permitting the operator to insert the new forms and align accurately below the platen rather than around it. On some accounting machines the opening and closing of the carriage for insertion and removal of forms is performed automatically, thus reducing the manual effort of the operator to a minimum.

Carriage Control. This has direct reference to the setting up of stops regulating the position of the carriage in respect of the forms to be used and special blocks, cams or rolls which provide automatic control of the operation so that in certain columns the accounting machine will not add; in other columns it will actuate both crossfooter and register; in others it will subtract in the crossfooter and add in the active register. In other words, it is possible by this special arrangement of stops and control devices to cause the machine to function automatically in the various columns, leaving the operator merely to tabulate to the proper column and depress the keys for the amount to be recorded. The control mechanism has such a wide range of usefulness that it is impossible to cover its possibilities in such a brief space. Many machines are built to print the month, day and year. This date may be set up each day and from "Carriage Control" will print automatically in the Date Column on the forms which are active for the day. On other machines, carriage control will permit the automatic recording of consecutive numbers or the repeat printing of amounts on such forms as ledger and statement, including the repeat printing of the balance on statement and ledger.

Proof of Posting. "Proof of Posting" on the average accounting operation is obtained through what is usually

termed "Second Pick-up of old balance." In any ordinary posting, the first operation is to pick-up the previous day's balance, which is accumulated in the crossfooter only. In the postings of debits or credits, the amounts may be accumulated in registers for each of the classifications of postings or if a larger break-down of postings is required, this may be obtained from what is termed "Keyboard Selection of Register." Following the completion of the posting to an individual account, a total is recorded in the Balance Column. As the carriage is returning automatically to the left marginal position, the form is removed from the machine, when the operator again refers to the previous balance and records it on the Proof Sheet, accumulating it in a special register provided for that purpose. Upon the completion of all postings, the machine will record the totals of the second pick-up of old balance, the new balance, and the debit and credit totals. As these totals are recorded on the paper, the amounts are automatically transferred as positive or negative amounts into the crossfooter, so that the net result should be a cipher, thus proving the accuracy of the work. Where credit balances occur the totals are reversed, that is to say, if the old balance is a credit it is accumulated in the new balance register or if a new balance is a credit it is accumulated in the old balance register. On some machines, the reversal of this register order is an operation performed automatically.

The above method of proving the accuracy of posting is generally employed when the machines are first installed and whilst the operators are becoming proficient in the operation of their machines. Other and more useful methods are generally adopted as the staff become more experienced and proficient in their work, for instance another method of Proof of Posting is that of "Direct Proof." Under this plan, the old balance is picked up and the postings are made as described above. The balance is recorded as a "sub-total," the amount being retained in the crossfooter. The operator again picks up the previous balance which is subtracted automatically from the new balance. The machine then records the difference, which if the balance has been picked up accurately each time, will represent the amount of the posted item. This amount is accumulated in a register and upon the completion of the posting, that total should agree with the predetermined total for the amounts posted.

Still another method is the "Line Proof," which is a plan frequently used in ledger posting where a wide distribution

or journal sheet is placed around the platen and the amount of the posting is distributed in the columns on the distribution sheet. In such an operation, the posting of the account would be made as described under "Direct Proof." Following the second pick up of the old balance, the amount of the debit or credit posting is distributed in to the related columns, the debit being subtracted, and the credits added. When the distribution is completed, the crossfooter should be clear. As a proof of accuracy, a clear symbol is recorded in either the extreme right- or left-hand columns, usually the latter as it may eliminate a considerable amount of unnecessary carriage travel to the extreme right-hand margin. Therefore, in a properly constructed form, the columns will be arranged from left to right in order of their activity.

The operation described above is frequently applied to distribution on journals or registers where ledger posting is not involved, the debit offsetting the credit entries, leaving the crossfooter clear on the completion of the last item of analysis.

Some accounting machines are constructed with what is termed automatic "non-clear-lock" so that the mechanism will not function at the commencement of the next line of posting if the crossfooter is not clear.

The Old and New Balance Proof. In less expensive machines the construction will not permit of the accumulation of more than one register total, and in such cases the new balance should be accumulated and the active accounts offset to the right in the ledger binder or tray to indicate an active account. When the posting has been completed, the operator will then record the total of the new balances and then finger through the active accounts, picking up yesterday's balances. This total subtracted from that of the new balance should equal the difference between debit and credit postings under any plan of operation.

The first pick-up of the old balance should never be accumulated in a register, for if it has been picked up wrongly the register total will be incorrect. The only accurate method is to pick up the balance the second time following the completion of the posting, accumulating that amount in a register. The first pick-up should only affect the crossfooter total.

There is, however, one exception to the above. Where there are comparatively few accounts to be posted and considerable activity in each one, it may be advisable to eliminate the additional operation of picking up the old balance the second time, securing the necessary check on the accumulation of the

work by taking a trial balance of all accounts. This total must agree with the control account.

Proof Sheets. Usually accounting machine concerns will recommend that either proof sheets or proof tapes be used. The former would contain a complete carbon record of all postings, whereas the latter would usually show only the old balances and the proof of items posted. Where errors occur in posting, the correction should be made on these records, noting the name or number of the account. These proof sheets should then be filed for a period of two or three months, or until the annual audit has been completed. While errors in the trial balance should be extremely rare, they may usually be located where they do occur, by checking back on the proof sheets, where it will be found that an error located by the machine-furnished proof has not been properly corrected.

Proof sheets or tapes are not generally used once an operator has become efficient as very few "pick up" errors are made in actual practice.

Credit Balances. On practically all machines credit balances are printed in oblique figures.

Accounting Machines. A general consideration of the various types of machines will be made under three main headings as follows—

1. Accounting machines with typewriting.
2. Accounting machines without typewriting.
3. Accounting machines, miscellaneous.

In the case of machines with typewriting facilities they are generally speaking of two kinds, that is with "built-in" Registers or with detachable Registers. Machines of the built-in type have their registers constructed and assembled within the machine and which are a permanent fixture or part of the machine, whereas the machines with detachable registers are constructed in such a manner that the registers are separate units which can be added to or taken away from the machine.

With both types, flexibility is easily obtained. The built-in type provide a special control bar or plate on which stops are fixed to regulate the adding or subtracting positions of the carriage. Greater flexibility is achieved on machines with detachable registers simply by sliding the registers along to the required position or by adding more registers to the machine.

A further distinction has reference to the number of keys used by the machine. With some machines there is provided

a full bank of keys for the amounts whereas in others only twelve figure keys may be used.

Accounting machines without typewriters will also have all of the above features. The main difference between group 1 and group 2 is chiefly a question of a typewriter for the printing of descriptions in full. Machines without the typewriter have provision for printing symbols only and which is very often sufficient for certain operations.

The above brief remarks should be sufficient to indicate the broad headings under which all machines are grouped for the purpose of study when a selection has to be made of the most suitable machines for any operation.

1. Accounting Machines with Typewriters (Short Keyboard).

All accounting machines under this classification are constructed with the accounting, or adding, mechanism actuated from a keyboard of ten or twelve keys. The argument advanced by the manufacturers of this type is that the same method of fingering the accounting machine as the typewriter should be maintained in order to develop a perfect rhythm of operation.

An illustration is given (Fig. 4) of an electrically operated model and which will give a very good idea of this type of machine, of which there are many different makes.

The machine consists of a standard typewriter equipped with a mechanism built into the machine so that amounts written on the machine can be added or subtracted as the numeral keys on the typewriter are depressed. Registers or Totalizers are attached to the machine for registering the totals of amounts added, or the net difference between amounts added and those subtracted, and one or more of these Vertical Registers can be attached to the machine, depending upon the number of totals required and the width of the carriage.

The machine illustrated is equipped with two crossfooters to register two horizontal totals, each operating either independently from or in conjunction with the other as desired. Crossfooters may also be used to accumulate the grand total of all or some of the vertical totals, or to accumulate the net difference between one group of vertical totals and those of another group of vertical totals.

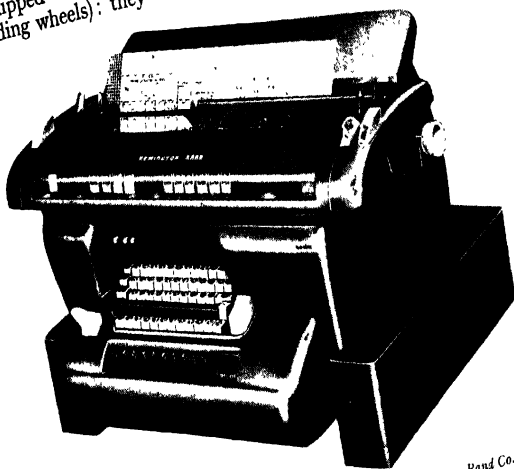
The vertical Registers being separate units, one or more can be attached to or detached from the machine, or moved from one column to another, by the machine operator. It is, therefore, possible for the operator to adjust the totalizers on a machine to accommodate more than one form on the

[MEC]

DICTIONARY OF COSTING

[MEC]

same machine. Vertical Registers can be obtained with from 5 to 13 adding wheels each—for registering maximum totals of from 9.19.11 to 99999999.19.11. Machines may be equipped with registers of different capacities (numbers of adding wheels); they do not have to be of the same capacity.



(Courtesy of Remington Rand Co. Ltd.)

FIG. 4. AN ELECTRICALLY OPERATED ACCOUNTING MACHINE WITH TYPEWRITER

Registers are obtainable in various styles—sterling, decimals, weights, measures, etc.

It should be noted that each vertical register will only add or extend the net difference between amounts added and those subtracted, as they are typed in the vertical column which it controls.

Another style of machine available in this group has a flat writing surface in place of the round or cylindrical platen of all other makes. An illustration of this machine is given in Fig. 5, from which it will be noted that it has a movable head which enables the operator to write in any position on the flat bed.

The movable head is operated electrically either horizontally or vertically, thus reducing the manual effort of the operator

to a minimum. The machine will accommodate up to twenty-nine registers and two crossfooters, and all addition and subtraction, both vertical and horizontal, are automatically controlled.

The keyboard consists of the regular ten-figure keys, the usual alphabet keys, plus the recognized standard feature keys.



FIG. 5. ILLUSTRATION OF ACCOUNTING MACHINE WITH FLAT WRITING SURFACE, CROSSFOOTERS AND REGISTERS

The flat writing surface permits the rapid insertion and removal of forms and the alignment and registration of forms of varying sizes, etc. Any size of form or thickness of paper may be employed and the machine is particularly useful where a large number of carbon copies is required.

1a. Accounting Machines with Typewriter (Full Keyboard). Machines of this class are constructed on a different principle to those mentioned above, and have the full keyboard and built-in registers.

The machine illustrated (Fig. 6) is equipped with the full keyboard electric adding machine which provides a separate key for each denomination, and enables all balances and totals to be printed automatically. The carriage is fully visible as in the standard typewriter.

The addition or subtraction from the various adding registers, the column selection, the printing of whole numbers, and many other features of the machine, are controlled entirely by movable stops, ranged on a control bar at the front

of the carriage. The adjustment of these stops will modify the operation of the machine in any way desired. A still speedier method of changing the set-up is available in the provision of individual control bars for each of the various types of work to be handled. This flexibility means that one

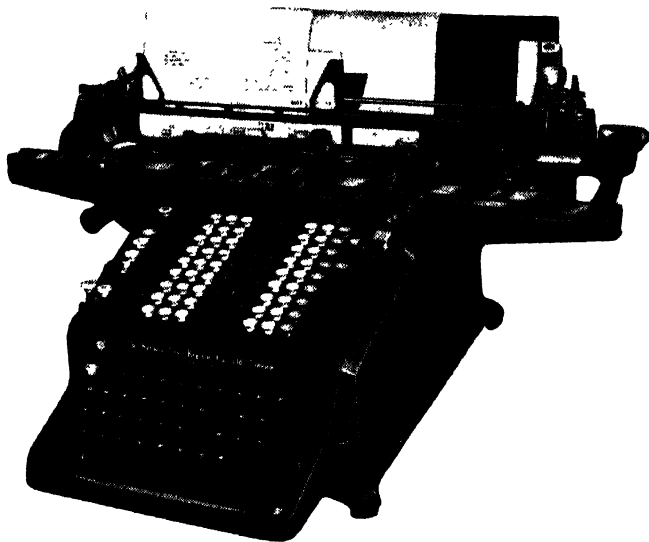


FIG. 6. ILLUSTRATION OF ACCOUNTING MACHINE WITH TYPEWRITER AND FULL KEYBOARD, FRONT FEED, BUILT-IN REGISTERS AND CROSSFOOTERS

machine can perform accounting work of every conceivable type, and in any way desired.

All tabulating movements from column to column are automatic, as is the printing of ciphers and punctuation. All balances and totals are computed and printed automatically. Dates and descriptive abbreviations are also printed automatically wherever required.

The machine is provided with a typewriter keyboard which enables a full description of any item to be given where it is required.

Machines of this type may be operated by what is termed the "short cut" method. Briefly this has reference to the simultaneous depression of keys. On these machines the

operator sees the complete amount and instinctively locates the thumb and first two, and sometimes three, fingers over the keys which the amount represents. These are depressed together with the motor-bar, which is covered by the little finger. The thumb usually covers the three lowest rows of keys, i.e. if the amount to be posted is £6,277, the thumb depresses the 2, and the first, second, and third fingers

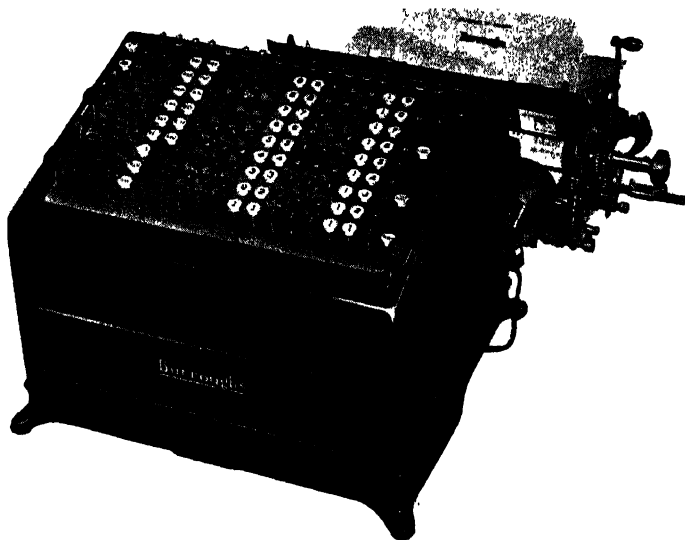


FIG. 7. ILLUSTRATION OF ACCOUNTING MACHINE WITHOUT TYPEWRITER—FULL KEYBOARD

the higher amounts, while the little finger covers the motor-bar.

Manufacturers of adding and accounting machines have failed in the past to realize that it is equally important that operators of these machines be trained in the scientific method of operation as it is for typists to be skilled in the one method of typewriter operation recognized as standard the world over.

The importance of having adding and accounting machine operators thoroughly trained in the recognized standards of operation to-day is most important.

2. Accounting Machine without Typewriter (Full Keyboard).

These machines, of which Fig. 7 is an illustration, are not equipped with typewriter mechanism but have what is known as the "full keyboard" of 13 to 17 columns of keys; 3 columns on the left sometimes being reserved for months and days, then one column for special codes of three letters each, sometimes a folio section of four columns, and the remainder of the keyboard for quantity or value.

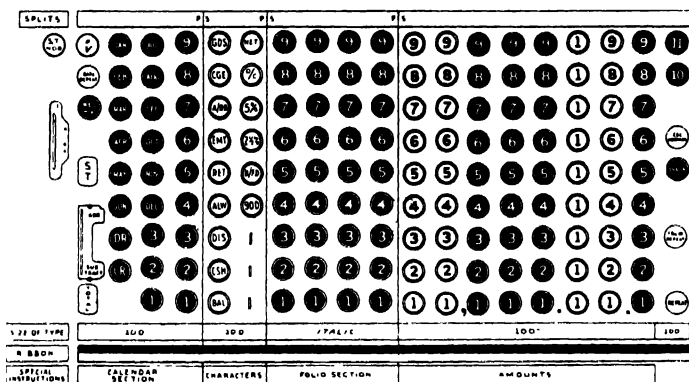


FIG. 8. ILLUSTRATING FULL KEYBOARD OF ACCOUNTING MACHINES

These machines are equipped with carriages which automatically open and close for the insertion and removal of accounts. They are very automatic in their operation, and are equipped with carriage-control or keyboard selection of registers, skip-tabulation, automatic repeat of printed items, and almost innumerable other features making that type of machine adaptable for practically any type of accounting, except where typewriter data or special computation is involved. These machines have built-in registers of from one to ten registers.

Fig. 8 shows very clearly what is meant by the full keyboard and how the rows of keys are split to suit any special set-up. It will be noted that this particular keyboard is split into four sections, i.e. calendar, or months and days, characters, which are codes or abbreviations of the description of the item, folio section, and amounts.

Another type of accounting machine with a full keyboard is illustrated in Fig. 9. The machine is equipped with a means of selecting twenty-seven separate adding registers in

conjunction with the amount keyboard, so that it is possible to take a batch of posting media and to record the various items and allocate them to the appropriate dissection heads without any pre-sorting.

Having recorded all items in this manner, the totals accumulated under each of the various heads can be printed on a summary sheet.

If it is required to obtain a sub-dissection then a small

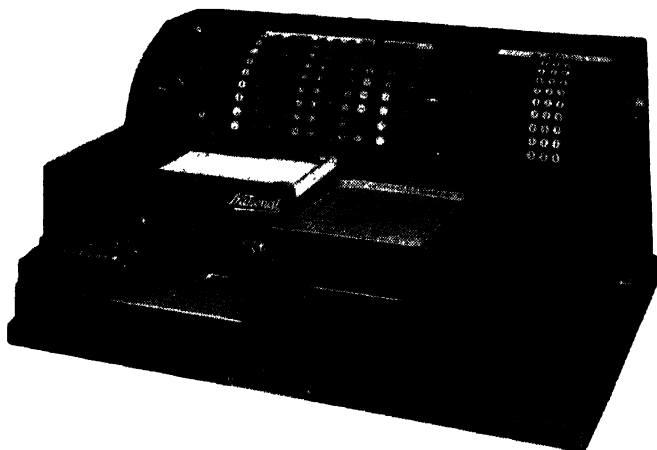


FIG. 9. ACCOUNTING MACHINE WITH FULL KEYBOARD AND EQUIPPED WITH TWENTY-SEVEN SEPARATE REGISTERS

ticket can be issued bearing the amount of the item, the main dissection head, the item number, and also the sub-dissection head number, which is entered from a reference keyboard situated on the right-hand side of the dissection control keys. The tickets can then at a separate run be re-analysed over the dissection totals and a summary obtained in a similar manner to the main dissection.

This type of machine can also be utilized for posting account records, thus providing the double advantage of a speedy posting medium with a rapid dissection. The machine has a positive aligning device and a flat bed printing table which facilitate the insertion of the records. The selection of the column in which the amount is to be printed is effected automatically by means of the dissection control key; and, after posting, the balance outstanding is extended

automatically, and the card ejected into the hand of the operator. These machines can also be supplied for the use of forms or sheets in place of cards. A reference keyboard provides a means of recording the descriptive matter against the posting.

Having posted the records, it is then an easy matter to obtain the totals accumulated over each of the dissection heads provided for on the machine.

An interesting application of this machine is the posting of stores records, with an automatic analysis of the value of such goods posted over a number of main heads. The machine illustrated has provision for the posting of a Stores Record Card similar to that illustrated (Fig. 10), which enables the entering of the receipts and issues in both quantity and value and the automatic computation and extension of a balance in stock for both the quantity and the value.

It will be seen that the Record Card has provision for all relevant detail, such as the suppliers' code, stock reports, maximum and minimum stocks, bin number, unit of supply, and that it forms a neat and compact record while omitting none of the essential information. When posting issues, for instance, the operation will be to bring forward the balance on the card for both quantity and value, record the quantity and value of the goods shown on the requisition in conjunction with the appropriate Departmental Dissection keys and the Requisition number, and then extend the balance in hand of the quantity and of the value.

The selection of the appropriate issue and balance columns is effected automatically by the machine both on the record card illustrated, and also on the continuous checking sheet which is prepared in original print automatically during the posting operation to the various accounts.

On completion of the account posting described above, the various Departmental totals are provided automatically by the machine and can be printed on Departmental Record Cards, which thus form a complete day, by day record of stores allocated to the different heads.

2a. Accounting Machines without Typewriter (Short Keyboard). The short keyboard machine is similar to most other types, the chief difference being in the employment of twelve numeral keys only. Speed in figuring is claimed for these machines. Fig. 11 illustrates the keyboard principle, and it will be noted that only three fingers are used in the operation of the figure keys. The method is as follows: If £2 17s. 9d.

has to be written, the operator simply depresses the keys 2.1.7.9 and the machine automatically selects the correct column for each figure. The fourth or little finger is used for depressing the operating keys. This method is known as the touch method, and is facilitated by the arrangement of the

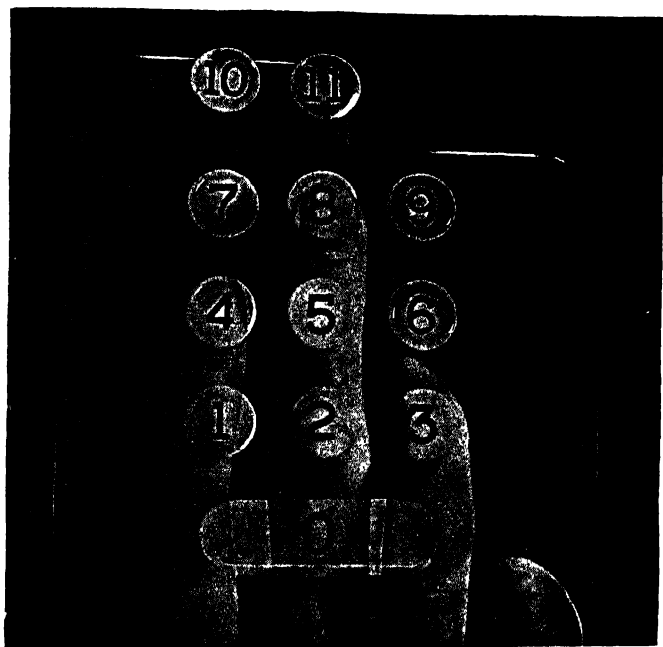


FIG. 11. SUNDSTRAND KEYBOARD

numeral keys in natural order and is acquired in a very short time. The small operating area eliminates hand motion, and in the touch method there is no necessity for the operator to look at the keyboard. These are important factors in the reduction of fatigue.

An illustration of a comprehensive model is shown in Fig. 12. The machine has two crossfooters and eight accumulating registers. It is fully electrically operated and embodies all the usual features. Automatic control of twenty-two different machine functions is obtained from an interchangeable control plate, which provides the necessary flexibility for the completely automatic selection and operation of any

desired combination of machine functions at each stage of any particular application. Three rows of keys on the left-hand side of the keyboard are provided for printing the date and descriptive abbreviations, and a bank of ten keys for folios.

3. Accounting Machines, Miscellaneous Types. Under this

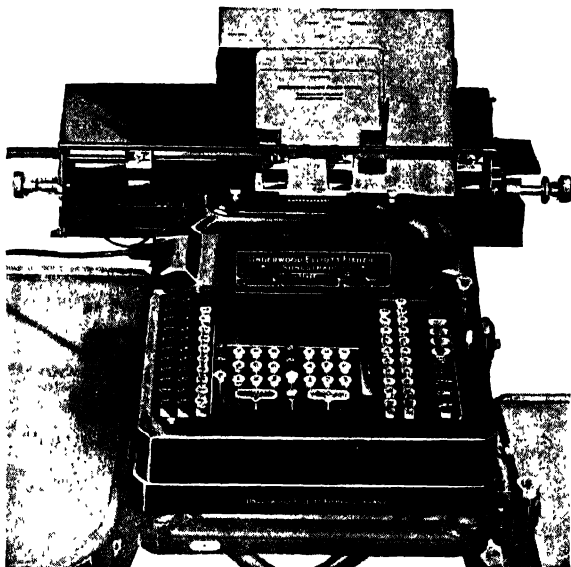


FIG. 12. ILLUSTRATION OF ACCOUNTING MACHINE WITH SHORT KEYBOARD AND WITHOUT TYPEWRITER

heading a large number of different types of machines will appear, simply because of the difficulty of classifying all machines under their appropriate heading. For instance, the machine illustrated in Fig. 13 is one of the most remarkable accounting machines. Incorporated in its construction is a complete typewriter accounting machine, and a complete computing mechanism. This machine is so constructed that multiplication is directly performed by the mere depression of multiplier keys, unlike many calculating machines on the market to-day, where the multiplication is merely repeated addition. In other words in multiplying 2345 by 55 in the majority of calculating machines, 2345 is first added five times

and then 23450 five times, whereas, in this accounting computing machine, any multiplication from 2 to 9 is performed by the mechanism stroking twice, mathematical tables having been built into its construction to produce direct multiplication.

Amounts for quantity or value may be recorded on the paper



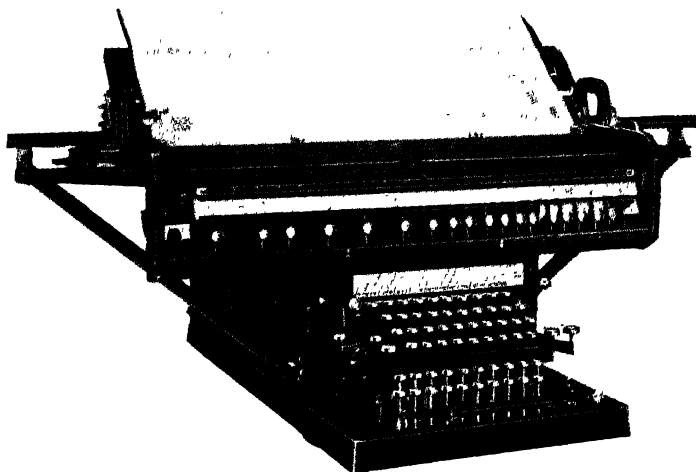
(Courtesy of Burrroughs Adding Machine Co., Ltd.)

FIG. 13. ILLUSTRATION OF A COMPLETE CALCULATING TYPEWRITER ACCOUNTING MACHINE

and extended into the multiplying section of the machine and as the multiplier keys are depressed the product is built up in the crossfooter.

If the multiplier is a decimal, a key is depressed which

automatically points off the proper decimal point. Where a fraction is over one-half it is raised automatically to a whole number and the final product of such calculation is automatically recorded on paper by the depression of the "Product Key." Where whole numbers and decimals are involved in the multiplication, the operator depresses a point off key the



(Courtesy of Burroughs Adding Machine Co., Ltd)

FIG. 14. A MULTIPLE-TOTAL ACCOUNTING MACHINE

required number of times in relation to the number of decimals involved.

This machine will perform all the operations of the accounting machines as described under (1) above, and in addition computes ordinary extensions and percentages, etc., in whole numbers and decimals only.

Another type of accounting machine illustrated in Fig. 14 is used for distribution and analytical work, and for the consolidation of cost figures; it combines full typewriter keyboard with automatic accounting mechanism.

Yet another type of accounting machine, known as the punched card system, makes use of cards in which small holes are "punched" in definite positions or fields. Such methods are more generally known as "Hollerith" or "Powers-Samas," and a full description of these machines will be found under their respective headings.

There are numerous machines on the market and it will be appreciated that all of them cannot be mentioned in a work of this description. The illustrations given of the various types were selected quite haphazardly from the many photographs available, and it must not be assumed that they represent the only machines available or the best of each type. Each make of machine will differ from the remainder in some respect and in studying the subject one should bear in mind that it is far preferable to consider each machine as a whole and not simply one special feature only. With certain operations a special feature may be an advantage, but this should not be allowed to detract from the mechanical operation of a complete process in the system.

Main Consideration in Planning a Machine Installation. The first consideration in the work of installing accounting machines is to simplify the costing or accounting routine by eliminating all unnecessary operations and to employ every possible short cut.

Each study of what appears on the surface to be a most complicated accounting problem frequently reduces itself to a comparatively simple one when it is realized that practically all accounting or costing is merely the obtaining of a debit posting to one account and a corresponding credit to another, of items singly or *en masse*. To accomplish this, there has been a tendency toward the use of wide journal sheets in which these related entries may be extended into vertical columns under the columnar heading of the accounts effected. The wider the spread of these journals the greater the difficulty in the distribution of these items into so large a number of columns. The wider the form, the fewer number of entries usually appear in either any one line or column, necessitating carrying forward many totals, some of which are not even active on the entire page.

While accounting machines are designed to handle forms as wide as 30 inches, it is suggested that special consideration be given to the importance of simplified accounting records. Wide, cumbersome forms are too frequently found in our offices.

Until recently the trend was definitely toward substituting narrower forms, perhaps maintaining a columnal distribution for the more active accounts, with a miscellaneous column in which are carried all of the less active accounts, both the amount and the corresponding account number or code being shown for the miscellaneous items, it being more practical to post directly from this miscellaneous column to the accounts

affected than to attempt to keep accurate record of them on the wide columnar form.

To-day the trend is toward the elimination of all journals, both wide and narrow, as methods have developed for the more rapid accumulation of the necessary debit and credit entries directly into the accounts effected and by various other methods. Journals are simply a legacy from old-fashioned methods and should have no place in modern systems.

The designing of a machine accounting plan is comparable to the erection of a building for which architects have carefully prepared plans covering all of the services which the building must render. Upon completion of the plans they are turned over to the contractors, who must follow most rigidly every detail of the architect's plans and in the erection of the building.

And so in planning for the accounting machine installation, the accountant is wise who first sits down and lays out on paper the results which are to be obtained from the machine installation. Too many err through merely planning to change ledgers, journal sheets, and other records over from "Pen-and-Ink" to accounting machines without due consideration being given to the possible change of forms and methods.

The better plan is to reverse the picture and give special consideration to the statements, summaries, or reports *which are the final objective*. Spreading out these final forms, the next question is how can the necessary figure facts be brought together to serve every final objective *with the minimum of clerical or machine recording*.

Having determined fairly definitely as to the type of accounting machine which will most probably meet the requirements, the next step will depend upon the individual making the installation. If one has a thorough knowledge of accounting machines and is familiar with all types, and their special features and method of operation, etc., one can proceed as described below, but in cases where one's knowledge of machines is limited, it is advisable to call in the accounting machine representative who will concentrate upon acquiring knowledge with reference to the customer's accounting practices and needs with more particular reference to the accountant's analysis of the immediate job for which accounting machines are to be installed. Together with the accountant, they should prepare an accurate picture of the present accounting plan. The second picture to build up is that of the proposed plan, including the equipment required and the economies to be effected.

The success of the installation depends very largely upon the work that is done prior to the actual machine installation. When the detailed analysis has been carefully prepared and the proposed plan of operation established covering all phases of work to be handled, the installation may be considered already better than 80 per cent completed. Any oversight in making the analysis, designing the new plan or formulating the specifications for the machines is bound to result in delay and difficulty in making the installation. These will, too, more than off-set any time which it was desired to save by hasty analysing and planning.

Just as every detail in the new plan must be carefully worked out before the machines are ordered, so must every detail of the installation be worked out before the machines are delivered. It is in the use of the equipment that all of the economies to be effected must be proven in actual practice.

A very high standard of performance of the new installation should be anticipated, and the manufacturer of the accounting machines informed that the sale is only completed when the machines are turning out the actual work scheduled day after day on a production basis which measures up to that high standard.

A most noteworthy achievement which was due to this careful method of analysis and planning of details before work is started on the new machine basis was in the national installation of over 800 billing machines by American telephone companies. In each installation the entire load was transferred from the old "Pen-and-Ink" system to the new accounting machine plan without any upheaval in the working routine in these various centres. In nineteen out of twenty installations there was no occasion for overtime and in every instance the invoices were mailed to the customer according to schedule. This achievement was due to five factors which should characterize every accounting machine installation.

1. A clearly defined, practical machine accounting method.
2. Accounting machines built from accurate specifications to meet the requirements, the number of machines supplied being based upon accurate data carefully analysed.
3. Careful planning and high-grade supervision.
4. Proper course of instruction covering a thorough but short training of operators.
5. Full co-operation between the cost accountant and the

manufacturers of the accounting machines during the entire installation programme.

The actual signing of the purchase order for the equipment should be regarded merely as the authority to proceed with the preparation for the installation. The accountant has the task of the revision of certain accounting methods, the local accounting machine organization concentrating on plans for operator training and actual installation. The two groups should harmonize their efforts, but at the same time appreciate and accept their individual responsibilities. The accounting machine representatives will be required to confer with those responsible for the installation in reference to the changes necessary in the accounting procedure, probably as to the organization of the staff and routine and certainly as to the obtaining of forms and other equipment. The selection of those who are to carry the responsibility for the execution of the plans is a very important question which too frequently is entirely overlooked.

Supervision. The accountant depends entirely upon the manufacturer to build accounting machines properly to the specifications agreed upon, and he should also look to them to properly instruct his operators. This, however, is not sufficient to ensure a successful installation. What is needed most is for the management to select someone in whom they have confidence to take charge of changing over to the new system. The one who is to supervise the installation, should be informed of the importance of this problem and that the responsibility for its success is on his shoulders. He should be relieved of other duties as far as possible.

If an important change is made in accounting methods, those responsible for the installation should have a clear understanding of the new plan prior to making the change.

The installation of the machine plan is one of the milestones in the progress of any concern in accounting methods, and the individuals who have the supervision of so important a transition are fortunate indeed. There are many young men and women to-day who look back to an accounting machine installation as the commencement of their success. They were given the responsibility. They planned every detail carefully in advance of the arrival of the machines, and inspired the machine operators with confidence, so that the installation was a happy experience for themselves and for their organization. The accounting machine representatives should work quietly behind them in offering ideas, and in assisting

them to understand accounting machines so that they can do much of the work themselves in connection with the drafting of the forms.

Whilst those in charge of an installation should receive full credit for everything that is accomplished, they should also be held responsible for the proper execution of the predetermined plan in every detail. Overtime on the part of the machine operators or those balancing their work should, in the majority of cases, be considered a serious reflection upon those in charge of the installation. In practically all cases the installation should be planned and managed so that overtime is unnecessary. In the few cases where overtime is necessary it should be foreseen before the installation starts and be made part of the schedule.

To ensure that nothing be overlooked, those who will have charge of the installation should prepare a work sheet. This consists of a list of every item which will need attention, and the date on which each item must be completed should also be noted to permit of effective follow-up. The items on the work sheet will usually be grouped under the following headings—

1. Preparing all necessary forms, equipment, and supplies.
2. Re-arranging the office.
3. Selection of machine operators and delegation of duty to other clerks.
4. Details of the operators' training.
5. Scheduling of the final installation.

The above few remarks in regard to the planning of a machine installation should be sufficient to guide the executive who has not had any previous experience in this work of the method of approach and of the sequence with which each item must be dealt. The subject has been discussed from the angle of mechanization as correctly applied, and not simply the change over of a hand-posted ledger to machine posting, which cannot be regarded as mechanization in its true sense.

A further point that should be kept in mind is that mechanization does not necessarily imply that *all* clerical operations have to be mechanized and that the staff must be reduced to achieve efficiency and economy. The most economical method is the one where machine work and hand work have been blended in correct proportions into a system, and when this has been accomplished the results will more than pay for the time and expense that have been expended on the installation. As regards the question of staff, this entirely depends upon

the conditions existing in any business, and if it is desired that the staff shall not be reduced, it is still possible to effect considerable savings in expenses; on the other hand, if the office is considered to be overstaffed, or that reduction in expense is necessary, then mechanization will make these savings possible. Mechanization should not be looked upon as a method for saving expenses simply by the reduction of staff, but rather as a method of increasing efficiency in the office and of reducing other incidental items of office expense. It has been the author's experience that the correct application of accounting machines has invariably given a very high percentage of saving in expense over former methods.

MERRICK DIFFERENTIAL OR MULTIPLE PIECE RATE.

The daily rate is not guaranteed under this wage incentive plan. There are three piece rates, the first of which is a straight piece rate which is applicable up to 83 $\frac{1}{3}$ per cent standard of output, at which point there is an immediate increase of 10 per cent, which is added to the straight piece rate, and is the second piece rate used and is effective to 100 per cent output. At this point there is a further 20 per cent increment, and this forms the third piece rate beyond the 100 per cent standard. This multiple piece rate method can be adjusted almost indefinitely; for example, the first step can be an increment of 5 per cent and the second increment 15 per cent, in which case there is a much stronger inducement to attain standard output. Owing to it being based on very accurate time studies, it is rather complicated and slow in installation, and perhaps not easy for the worker to comprehend.

Furthermore, unless some form of arithmetic slide rule be used, extra clerical help will be required. Its principal advantage is that it is not so harsh as the Taylor differential on operatives of low efficiency.

The effect on the cost per piece produced is as marked as in the latter. (See also WAGE INCENTIVE.)

MERIT RATING. In Job Evaluation the requirements, duties, and conditions that the occupation imposes upon the worker are appraised and a monetary value determined.

This does not take into consideration the characteristics of the workmen beyond specifying physical requirements, education, and training necessary. Workers possess other characteristics in varying degree; ambition for promotion, dependability in attendance and good workmanship, adaptability in meeting new conditions, have a definite value. Workers with

these traits are more desirable than those lacking them. Merit Rating is accomplished by consideration of the extent to which the worker possesses each of the characteristics peculiarly desirable to the industry or plant.

With small companies, individual recognition will usually take the form of an occasional pat on the back or a well-timed reprimand by the foreman, but with the larger companies some foremen will be harsh and some lenient. Workers and foremen may be moved around so that the foreman who knows a man best may not be consulted when a question of raise in pay, promotion, or lay-off is being considered. A method of standardizing and recording these reprimands and pats on the back is needed.

In considering Merit Rating it is necessary to make a clear distinction between the rating of jobs (Job Evaluation) and rating the individual (Merit Rating). Merit Rating simplifies the process of analysing a worker's abilities.

Merit Rating resembles Job Evaluation in that it has factors, factor degrees, and point values; and whilst Job Evaluation can be fairly complex, a Merit-rating plan must be simpler, because it must largely be applied by foremen and supervisors. An example of a simple plan follows.

Merit-rating Factors. The actual qualifications selected for judging workers will naturally depend upon the nature of the business carried on, the number of workers employed, and the type of employee. There are five standard factors used and which can be subdivided according to the special requirements of each concern. These five factors are—

1. Disposition and attitude.
2. Industry and dependability.
3. Judgment and resourcefulness.
4. Aptitude or ability to learn.
5. Job performance.

Disposition and Attitude. Any employee who will work co-operatively with others is of more value than a more efficient worker who is always breeding discontent and complaining about others whom he thinks should do more work or who should not have been promoted. Ability to create congenial atmosphere or contacts with others is closely related to attitude and disposition.

Appearance and habits, which includes such characteristics as confidence or instability, modesty or conceit, generosity, selfishness, etc.

Industry and Dependability. This factor determines how

MERIT RATING CARD										NO...			
NAME		DEPARTMENT											
FACTORS		RATINGS											
Above Average	Average	Below Average	Poor	Date	Job Code No.	Rate	Graded by	Disposition and Attitude	Industry and Dependability	Judgment and Resourcefulness	Aptitude and Ability to Learn	Job Performance	Total
30	20	10	5										
35	25	15	10										
30	20	10	5										
30	20	10	5										
40	30	20	10										
Special Remarks:													

(Size of Card 8" x 5")

much an employee works as against how well he works under (5) Job Performance. A worker's attendance record is important in this factor, as is also the question: "Does he stretch out his rest periods and lunch hour?"

Judgment and Resourcefulness. Under this heading is measured an employee's judgment, initiative, and resourcefulness. Can he handle a job without instruction or analyse an assignment and carry it through to a conclusion, etc. The

Form No. 60.

MERIT RATING REPORT				
NAME		No.		
DEPARTMENT				
Date				
Factors	Above Average	Average	Below Average	Poor
Disposition and Attitude .				
Industry and Dependability .				
Judgment & Resourcefulness.				
Aptitude and Ability to Learn				
Job Performance . . .				
Indicate factor score by placing X in appropriate column.				
(Signed)				
Foreman or Supervisor				

(Size of Form 5" × 4".)

extent to which an employee receives or requires supervision is also an important consideration.

Aptitude and Ability to Learn. This factor covers an employee's adaptability, intelligence, and ability to learn new kinds of work.

Job Performance. This is a most important factor, and

the speed, accuracy, and thoroughness with which an employee does his job. An efficient worker who does not waste materials or time is valuable to a company. In judging job performance, speed must be balanced against accuracy, efficiency, and adherence to required standards of workmanship.

Point System. A Merit-rating plan must include point values similarly to Job Evaluation, so that the ratings can be totalled and recorded. A specimen Merit-rating card (Form No. 59) is given to illustrate a very simple plan.

With this method the foremen or supervisors of each department are instructed to rate all the employees in their department by filling in a Merit-rating Report similar to Form No. 60. These reports are then sent to the office and the results entered on to Form No. 59.

Instructions to foremen regarding the method of reporting must be made very clear, and a proper understanding of each factor and what characteristics are involved.

The result of the current Merit Report is compared with previous reports shown on the Merit-rating Card and any unusual variation checked with the foremen.

METAL CHECKS. With small factories a record of the attendance of employees is sometimes obtained by the use of metal checks. Each worker is provided with a brass check on which is stamped his number, called a check number. The checks are hung on boards in numerical sequence and placed at or near the entrance to the factory. As each worker enters the premises, he lifts his check from the board and drops it into a box and proceeds to his work. At predetermined times, usually a few minutes after starting times, the time clerk or gatekeeper removes the checks from the box and enters their numbers on to a sheet or time book. The checks remaining on the board are next entered on a "Late or Absentee Report," and the two records then passed on to the wages clerks, who write up the pay roll from these lists.

The above method offers very little advantage over the "Time Book" method. Disputes will arise in many instances, and these can rarely be settled to the workman's satisfaction, owing to the absence of a reliable written record. It is not uncommon also for a workman to "lift" his absent friend's check from the board and drop it into the box with his own, thus registering the attendance of absentees.

Metal checks are sometimes used in connection with other methods of time recording, particularly when a worker has a fair distance to walk between the gate or time office and his

bench or machine. In such cases the worker will clock "on" his card at the gate and then lift his check from a board. On arrival at his department or bench his check is dropped into a box. The foreman or his clerk collects the checks at stated times. The object of this method is to check any waste of time through loitering, etc.

Checks are also used by some concerns as a means of identification on pay days. Each workman takes his check from a board which is placed in his department, and proceeds to the pay clerks, handing the check to them in return for his pay envelope.

METHODS OF COST FINDING. (See COST FINDING—METHODS OF.)

METHODS OF REMUNERATING LABOUR. (See WAGE INCENTIVE.)

MINIMUM OUTPUT—BASING EXPENSES ON. (See ESTABLISHMENT EXPENSE.)

MINIMUM STOCK. A term used to denote the quantity below which the stock should not be allowed to fall, and the limit below which the normal demands of the factory could not be met.

The fixing of a minimum stock figure will be determined by the nature of the item, the rate of consumption, and the longest period required to obtain an economical quantity. With regard to the nature of the item a minimum quantity can only be fixed for those materials which will be in continuous demand by the factory for general production, as other items which may be required to complete a customer's special order will only be purchased as and when required. The minimum stock figure will, therefore, only relate to standard raw materials and parts for manufacturing and for general use on service or standing works orders.

In conjunction with a minimum stock there will be used a maximum stock, which sets a justifiable limit to the amount of stock which should be on hand at any time.

The object of operating stocks of materials on a minimum-maximum basis is twofold, namely, to prevent the holding of excessive or inadequate stocks, and as both are inter-related they may be considered simultaneously. One of the greatest forms of waste in industry is the uneconomical and excessive buying of materials which invariably results in the "locking up" of too much capital and the "writing off" of losses at the end of each financial period through obsolescence and falling prices. On the other hand, the failure to stock an

adequate supply of materials, sufficient to meet general manufacturing requirements, leads to unnecessary and costly delays in the factory. The need for some means of controlling the quantities of standard materials that should be held in stock at any time is, therefore, evident.

The rules to be observed in the calculation of minimum and maximum quantities are simple. Firstly, the average rate of use is considered, and secondly, the period of time required—taking the longest period, not the average—to obtain the economical quantity. The minimum stock or quantity below which the stock should never be allowed to fall is then represented by the quantity (plus a margin for safety) of the article which will meet the normal demands of the factory whilst the quantity ordered is being obtained.

The “maximum stock” is taken at something above the totals of these two, but it may be limited by financial considerations.

Great care is needed when fixing the above limits, as it will be seen that if the minimum figure has been set so as to be certain that sufficient material will be always available, there may be an inclination to over-stock, whereas if the minimum is fixed with a view to keeping stocks as low as possible, there may be periods when consignments will be delayed. To overcome the possibility of this trouble arising, a “re-order” point may be fixed which corresponds to the minimum quantity. When the stock of any item falls to the “re-order quantity,” therefore, a purchase requisition is then issued instead of waiting until the quantity falls to the minimum.

The minimum stock is set below this “re-order quantity,” and then becomes the real danger point.

The minimum, maximum, and re-order figures must be noted on the bin cards and stock record cards.

MINING COSTING. (See SINGLE OR OUTPUT COSTING; also COST FINDING—METHODS OF.)

MISCELLANEOUS DEPARTMENTS. (See DEPARTMENTS, also SERVICE DEPARTMENTS.)

MORTGAGE CHARGES. (See MORTGAGES—INTEREST ON.)

MORTGAGES—INTEREST ON. The treatment of interest on mortgages in cost accounts will depend upon the actual circumstances of each case; for instance, where a business requires a loan for a short period in order to complete some special or specific contract, the interest payable thereon must not be allocated to establishment expense and recovered amongst the various indirect items over the whole output

of a factory, but should be a direct charge to the job or contract for which the money was specially required.

In those cases where a business issues a mortgage on its factory and office buildings and land for the purpose of obtaining additional working capital, the interest charges thereon may be dealt with by either of the following methods—

(a) To regard interest as a general charge to the business and include among the establishment expenses.

(b) To regard the interest payable as a charge against gross profits and exclude it from the cost accounts.

As a Charge to Establishment Expense. When this method is used the amount of interest is firstly allocated to the administrative expense, which, in turn, is then arbitrarily apportioned over both the Factory and Selling Departments, according to the extent it is considered each will benefit therefrom.

Each case, however, must be considered upon its own merits, as it may be that a larger portion of the extra capital will be spent upon, say, advertising, and only a small amount actually used in production. In such a case it would obviously be incorrect to charge the interest to the Factory and Selling Departments in equal proportion. On the other hand, if the greater part of the money is expended in new plant, then the factory should bear its correct share of the expense.

As a Charge Against Gross Profits. When mortgage interest is regarded as a charge against the gross profits of a business, the item is transferred direct to the Profit and Loss Appropriation Account, and does not appear in the cost accounts.

The treatment of mortgage interest should be regarded from a different viewpoint to interest on capital or on debentures, as a business that has sufficient working capital will rarely, if ever, issue a mortgage upon its premises. It may, therefore, be safely assumed that the issue of a mortgage will usually follow on the failure to raise additional working capital by the more general manner, i.e. by the issue of shares.

From the above it will be seen that the correct treatment of interest on mortgages depends upon the circumstances under which they are issued. The interest payable on mortgages that are issued for long periods, and for the purpose of providing finance for the business generally, is more correctly a charge against the gross profits of the business and should not, therefore, appear as an item among the establishment expenses.

The treatment of mortgage charges in the manner indicated may appear a controversial point to some minds, but it is argued that the circumstances which necessitate the issue will decide the method of treatment in the cost accounts.

When money is raised by this means, and simply because the working capital of the business has been reduced through the purchase of additional assets, or dissipated through losses made in previous years, the increasing of the cost of manufacture by charging interest to costs is not justified.

For a general consideration of "interest as an item of cost," see **INTEREST ON CAPITAL**.

MOTION STUDY. The examination of an operation to determine the most economical procedure.

Each element of the operation is studied to distinguish really essential movements, others are eliminated. Each of these movements is examined critically for simplification and convenience.

Revision in layout, hand tools, or equipment design may be adopted to bring operations up to a high standard of efficiency.

The degree to which Motion Study is applied is generally determined by its economic return. Usually it is carried on simultaneously with time study. Very detailed analysis may require use of motion picture cameras.

For detailed application of Motion Study procedures, the reader should refer to a text on this subject.

MOVE TICKET. (See **WORK TICKET**.)

MULTIPLE COSTING. (See **COST FINDING—METHODS OF**.)

NATIONAL INSURANCE. The amount of the employer's contribution forms part of the establishment expense of a business, and the amount is allocated direct to the Administrative, Selling, and Factory Departments. This analysis is very easily effected, as the Salaries list or pay roll will give the actual figures each week. In those cases where the factory expenses are analysed by departments, the pay roll should be arranged departmentally wherever possible, so that the amount of the employer's contribution per department will be easily ascertained.

When departmental analysis of the pay roll is not possible, the amount is sometimes apportioned arbitrarily, but with large concerns actual analysis must be made of this expense item.

NORMAL MAXIMUM OUTPUT CAPACITY—BASING EXPENSES ON. (See **ESTABLISHMENT EXPENSE**.)

OBJECTS AND ADVANTAGES OF COSTING. If a system of costing is to be of any real value to the manufacturer, it must be far more than a mere branch of ordinary financial accounting. Ordinary accounting deals with the *external* transactions of a business from a purely financial point of view, and in all cases in bulk and in terms of cash; whereas cost accountancy deals with the *internal* transactions, and from the point of view of manufacture and distribution.

A costing system must accommodate many other problems besides purely monetary values. It must deal in terms of efficiency, time, weight, volume, etc., and connect the manufacturing operations with the financial transactions by interpreting the former in terms of cash.

The objects of costing may, therefore, be stated as—

1. To determine the actual cost of each article, process or operation.
2. To compare the actual cost with the estimate or standard.
3. To provide statistical data in the form of reports and statistics so that a factory can be managed on the basis of facts.
4. To reconcile with the financial accounts in terms of true cost the expenditure incurred and charge it to production, distribution, and management.

The advantages derived from the use of a good costing system are—

1. The amount of profit or loss on the manufacture and sale of different products can be ascertained and localized.
2. By making it possible to compare the actual cost with the estimate, it enables future estimates to be prepared with more reliance, and provides a sound basis for establishing sales policies and prices.
3. The management of a business is aided by the information made available by a good system of costing, as the efficiency of each department can be examined and compared with that of others.
4. The provision of accurate and detailed costs enables the business to be managed and controlled efficiently, as excessive costs, waste, and unremunerative expenses can easily be detected and eliminated.

Three clearly defined branches of cost accountancy have now been indicated, namely—

1. **Cost Finding**, which relates to the method used to ascertain the detailed and total cost of any desired article, process or service.

2. Cost Control, which provides, firstly, the means of controlling in detail and total all expenditure incurred in connection with production, distribution, and management ; and, secondly, the basis for reconciling the total cost with the financial accounts.

3. Cost Estimating is the predetermination of the probable cost of an article, process or service when incurred under given conditions

OBSOLESCENCE. (See DEPRECIATION.)

OFFICE EXPENSE. (See ESTABLISHMENT EXPENSE.)

OFFICE FIXTURES AND FITTINGS comprise such items as desks, tables, shelves, racks, and partitions, etc., when not forming part of the main building structure.

The value of office fixtures is part of the capital assets of the business. The cost of their repair and maintenance is charged to establishment expenses and allocated direct or apportioned to the Administrative and Selling Departments' Expense Accounts.

When the amount expended on repairs is large, the cost is then collected by means of a system of service orders which, as far as possible, should show the expense incurred by each department separately. In the case of small concerns, it is often more desirable to regard fixtures and fittings as part of the main building and to include the repair charges among the repairs to buildings. (See also FIXTURES AND FITTINGS.)

OFFICE ONCOST. (See ESTABLISHMENT EXPENSE.)

ONCOST METHODS. (See ESTABLISHMENT EXPENSE.)

ONCOST. (See ESTABLISHMENT EXPENSE.)

OPERATION METHOD OF COST FINDING. The operation method of cost finding is a term that is very often used to indicate the job costing method when applied to the costing of goods by "operation" rather than by the piece or quantity. With many engineering works this type of costing is used as well as the ordinary job costing method, as it will sometimes be found more convenient to cost certain articles or parts according to the operations performed on them, and particularly in such cases where certain articles or parts must be stocked in a partly finished state for convenience in making up special orders.

With some industries many operations are the same up to a certain point, when the goods are then placed into stock in their semi-finished state. The articles are then drawn from stock when the final operation is performed to meet the special

requirements of the different customers. In such instances the operation cost method is necessary, as the finished state of the product cannot be ascertained until after receipt of the customer's order.

In certain kinds of wood-working plants, especially those that machine small quantities of timber to customers' requirements, the operation method can be used to advantage, as the cost of most operations, such as planing, sawing, moulding, etc., is more easily figured by the lineal foot or other suitable basis, owing to the small amount of machining required.

The use of special purpose machinery is another instance where the "operation" method of costing is specially suitable due to the uniformity of the work performed, and in this instance it should be noted that an operation need not necessarily be restricted to the one kind of material, provided the nature of the operation is such that the cost can be calculated on the basis of speed or stroke, and by the quantity, such as per lineal measure, per piece, etc. In the manufacture of rivets, for instance, the special machines used for this purpose may turn out a complete rivet at each revolution. The cost of the operation may, therefore, be figured on the basis of the number of revolutions per hour, as the operating efficiency of the machine is governed by the number of revolutions. The variation in speed of output brought about by the use of different kinds of materials would, therefore, be taken into consideration.

With the above method of costing the "job" covers the individual operation instead of the complete article or piece of machinery, and we therefore still have the job costing method, but with a different unit of output to that usually associated with the more general form of job costing. (See also **COST FINDING—METHODS OF**, and **JOB COSTING METHOD OF COST FINDING**.)

OPERATING COSTING. Where services are rendered rather than goods produced, this method of cost finding will generally be used. A single measurement demonstrates the work performed, though it may vary in kind, as when a railway board reckons work performed as per passenger mile or per ton mile, etc., or an electric supply undertaking per Board of Trade unit or kilowatt-hour.

Operating costs render possible the costing of transport undertaking and other public utility concerns, such as electricity supply, water, and, in some cases, sewage and gas companies, etc.

One of the outstanding features of operative costing is a comprehensive classification of all expenses. In the case of a tramway company, a distinction is first made between maintenance charges and those expenses which directly relate to the running costs ; also general administration, and each of these main groups is again analysed according to the size of the undertaking.

Maintenance charges, for instance, may be classified to show in the first place—

- (a) Maintenance of permanent ways.
- (b) Maintenance of overhead equipment.
- (c) Maintenance of buildings.
- (d) Maintenance and repairs of rolling stock.

Each of these main headings may be further analysed to show the amount expended on the respective kinds of assets as follows—

- (a) Maintenance of permanent ways—
 - 1. Ordinary maintenance.
 - 2. Renewals.
- (b) Maintenance of overhead equipment—
 - 1. Overhead equipment.
 - 2. Cables.
 - 3. Section boxes.
 - 4. Sub-stations and plant.
- (c) Maintenance of buildings—
 - 1. Car sheds.
 - 2. Repair shop.
 - 3. Stores.
 - 4. Offices.
- (d) Repairs and maintenance of rolling stock—
 - 1. Car bodies.
 - 2. Motors and controllers.
 - 3. Axles and wheels.
 - 4. Lighting equipment.

The costing routine and the detailed work involved will not be so extensive as with the job or process methods of costing, as the operation of the method will be almost limited to the analysis of stores consumed and expenditure directly connected with the running of the cars, etc. Repair and maintenance work, however, may be dealt with on the job costing principles ; and all time, materials, and direct expenses booked to each repair job, the total of such job costs being closed out to the respective maintenance accounts as above.

Form No. 62.

PAY ROLL
FOR THE ENDED....19..

No.	Name.	Grade.	Rate.	Amount.	Allocation.						
					Capital as per Allocation at foot.	Generation.	Distribution.	Operation.	Cars and Car Equipments.	Buildings.	Permanent Way.

Form No. 63.

COMPARATIVE SUMMARY OF INCOME AND EXPENDITURE

FOR ENDED.....19..

INCOME

Route.	For corresponding period of ended.....				For ended.....				Increase.		Decrease.	
	Receipts.	No. of Cars.	No. of Passengers.	Receipts per Car Mile.	Receipts.	No. of Cars.	No. of Passengers.	Receipts per Car Mile.	Receipts.	No. of Cars.	No. of Passengers.	Receipts per Car Mile.
Traffic Receipts												
Sundry "												
Total for period												
Brought forward from immediately preceding period												
Total to date												

Form No. 63 (contd.).

EXPENDITURE

Description.	For corresponding period of ended		For ended.....		Increase.		Decrease.	
	Amount.	Per Car Mile.	Amount.	Per Car Mile.	Amount	Per Car Mile	Amount.	Per Car Mile.
Operation								
Generation								
Distribution								
Buildings								
Permanent Way								
Cars and Car Equipment								
Administration and general								
Total for period								
Brought forward from immediately preceding period								
Total to date								

Form No. 64. DETAILED COST STATEMENTS AND STATISTICS
FOR ENDED.....19..

Description.	Amount.	Total.	Per Car Mile.	
			This year.	Last year.
(a) Operation—				
Inspector's Wages				
Clerks' and Storekeepers' Wages				
Drivers' and Conductors' Wages				
Point Boys', Car and Track Cleaners', and other Wages				
Salaries				
Stores				
Water				
Light				
Sundries				
Total				
(b) Generation—				
Wages				
Salaries				
Fuel				
Oil, Waste, Water, and Engine-room Stores				
Repairs and Maintenance—				
Power Station Buildings—Wages				
Stores				
Engines and Boilers—Wages				
Stores				
Dynamoes, Transformers, Motors, etc.—Wages				
Stores				
Other Machinery, Instruments, etc.—Wages				
Stores				
Accumulators—Wages				
Stores				
Sundries				
Total				
(c) Purchase or Energy—				
(Particulars.)				
Total				
Distribution—				
Wages				
Salaries				
Stores				
Repairs and Maintenance—				
Sub-stations and Plant—Wages				
Stores				
Overhead equipment—Wages				
Stores				
Cables and section boxes—Wages				
Stores				
Sundries				
Total				
Buildings (excluding Power Station)—				
Wages				
Salaries				
Stores				
Total				
Permanent Way—				
Salaries				
Ordinary Maintenance—Wages				
Stores				
Renewals—Wages				
Stores				
Total				
Forward				

Form No. 64 (contd.).

Description.	Amount.	Total.	Per Car Mile.	
			This year.	Last year.
Forward				
Cars and Car Equipments—				
Wages				
Salaries				
Repairs and Maintenance—				
Car bodies—Wages				
Stores				
Motors and Controllers—				
Wages				
Stores				
Trucks and Gear—				
Wages				
Stores				
Axles and Wheels—				
Wages				
Stores				
Trolley Poles and Wheels—				
Wages				
Stores				
Lighting Equipments—				
Wages				
Stores				
Sundries				
Total				
Administration Charges—(chief office)				
(Particulars.)				
Total				
Aggregate for period				

Description.	This Year.	Last Year.
1. Route mileage of Wires operated		
2. Number of Car Miles run		
3. " Hours		
4. " Service Hours		
5. Receipts per Car Mile		
6. " " Car per day		
7. " " Route Mile		
8. " " Messenger		
9. Expenditure per Route Mile		
10. " " Car Mile		
11. " " Passenger		
12. Units generated and/or purchased		
13. " sent out from Station		
14. " used in Offices and Works		
15. " used in Street Lighting		
16. " sent out to Cars		
17. " per Car Mile		
18. " maximum demand (k.w.) of traction load		
19. " per Mile		
20. No. of Car Miles per hour, <i>i.e.</i> Car Miles		
21. Lost Mileage ar Hours		

No. of Passengers carried at each Fare.	This Year.	Last Year.
$\frac{1}{2}$		
1		
$1\frac{1}{2}$		
2		
3		

ORDER METHOD OF COST FINDING. (See JOB COSTING METHOD OF COST FINDING, also COST FINDING—METHODS OF.)

ORDERING LEVEL. (See RE-ORDER QUANTITY.)

ORGANIZATION—PRINCIPLES OF. Cost Accounting is so intimately related to organization and management that it is most difficult to discuss costing unless one has a thorough understanding of the principles of organization and management. To install or even operate a costing system satisfactorily without this knowledge is impossible.

The necessity for this knowledge will be appreciated when one considers that in most cases the basis of a cost is a unit of output and that the costing of a unit will require that the output of a plant be analysed or departmentalized so that the individual units or operations can be separated. A plant must be well organized if it is to function efficiently, and if we are to be in the position to analyse and connect the function of manufacturing with the selling and administration divisions of a business it follows that a thorough knowledge of organization is a necessity. However, all that can be attempted in the small space available is to briefly outline the broad principles of organization and management, as to deal with the subject fully would require the space of a whole book.

Industrial concerns may be divided into three classes as regards the basis upon which they will expand. In one class we have what is known as the "Horizontal" and in another class the "Vertical." In the case of the former the expansion of the business will proceed in a horizontal manner, products of a similar nature being added to the existing lines. For instance, a concern manufacturing a certain product that is seasonal may only be selling this product during the winter months and rather than have their plant idle or on short time during the remainder of the year will generally take up the manufacture of another product that will have a sale during the summer months. By this means their expansion is what might be regarded as taking place upon a horizontal plane and the expansion of a business of this kind may go on almost indefinitely so long as the variety of the products can be increased. In the case of the manufacture of silk underwear, a lightweight garment may be made during the winter for summer sale and heavy weight garments made in the summer months for winter sale. The natural expansion in this case would be the manufacture of suitable garments for the spring and autumn trade. Food products offer another good example of the horizontal class of concern. Certain food products

are perishable and they cannot be manufactured in large quantities and stored for future sale, products of a similar nature are therefore made and sold in the different seasons.

The object of concerns of this class is to round off their line of products so that a continuous manufacturing and selling activity is maintained throughout the year and the plant kept on a regular or steady production. The selection of new lines for expansion must have reference to the type of selling organization in use as the same selling staff must be able to handle the additional products. Manufacturing processes must be similar or of such a nature that most of the existing plant and machinery can be utilized.

A business that will expand in a vertical manner will include such industries that manufacture a product requiring machinery or methods that cannot be adapted for other kinds of products. The growth of such businesses will be in the direction of increased output in these products only, rather than an increase in the variety of products. An example of this type of business is the manufacture of motor car tyres. The machinery used in this instance cannot be used or adapted for other products, as the moulds and curing equipment, etc., are unsuitable for other kinds of rubber products. Expansion in this case is practically limited to increasing its sales and output up to the point where the plant will be fully employed throughout the whole year in producing tyres for sale during the spring and summer season. This process is followed until the sales equal the full capacity of the plant, when additional machinery is obtained and the plant enlarged to take care of further expansion.

The manufacture of paint and varnish is another example of the vertical class of industry as expansion is confined to the increasing of sales in the one line of products only.

Certain industries are of such a nature that they will expand both horizontally and vertically, such as the manufacture of rubber goods cited above, and whilst the expansion in regard to motor car tyres will be vertical, the expansion in regard to other kinds of goods will be in a horizontal manner, as they will mostly consist of seasonal lines. Rubberized fabric used in the manufacture of mackintoshes or waterproof garments is purely a seasonal line, as also rubber footwear and garden hose, etc., and we, therefore, have industrial concerns that are divisible into three groups, i.e.—

1. Horizontal.
2. Vertical.
3. Combination of 1 and 2.

Types of Organization. The type of organization that will be employed by any business will to a large extent be determined by its size and the nature of the products manufactured or the service rendered. For instance, with the very small concern the question of organization will not present much difficulty as one will usually find that the owner-manager is able to effectively control all sections of his business with the help of a junior or perhaps one clerk. With the larger concern employing 1,000 or 2,000 workers, an organization is needed that will accommodate all the peculiarities of the business. Some industries require a larger office staff than others, whilst the size of the clerical staff in the works will be smaller in one plant than another. In some instances, one may also find that the clerical staff in the plant will be much larger than the clerical staff in the office. Variations in almost all directions will, therefore, be encountered and each business must be considered by itself.

The basis upon which the plant or manufacturing departments will be organized depends entirely upon the size of the business, and the nature of the manufacturing processes.

Engineering is perhaps the most difficult type of industry to discuss in this direction, as almost each plant will require different treatment due to the great variety of manufacturing processes that will be carried on, also the variation in the number of workers employed. Two plants each making a similar type of product and each of the same size will invariably be organized on a different basis. The use of different types of machinery, different lay-out of departments and variations in the types of labour employed, will affect the methods of organizing in the plant. For instance, an electrical engineering concern whose output chiefly consists of special machines will require different treatment to another electrical concern whose entire output consists of standardized products made on a quantity production basis. In the former case there must be provided a routine that will handle the bulk of the output against special orders, whereas in the latter case the standard products will enable standard manufacturing processes to be used and in place of the special orders there will be a standard formula or instructions that will control production in large quantities.

The type of supervision required by both these businesses will differ as the plant that is producing special machinery will need a different kind of supervision to the plant operating upon a quantity production basis. This difference in supervision

will also require a different form of plant management and plant office organization. In the one case, special production orders will be issued for each special machine, whereas, the plant engaged upon standard production will be able to issue standard instructions and which may be permanent in character.

The above few remarks are sufficient to show that no standard instructions can be given regarding the best type of organization that should be used in any one case. Consideration must be given to all the peculiarities of each business before one can decide how to set out the organization.

General Organization. The types of organization usually applied to manufacturing concerns are divided into three groups or classes, i.e.—

1. Functional Organization.
2. Line Organization.
3. Combination of Line and Functional.

The organization of the small business needs little discussion as most businesses of to-day have developed from the small concern of about forty or fifty employees. It is in the expansion and development of small concerns that the Cost Accountant is able to exercise a most useful influence upon the future operating efficiency of the Manufacturing, Selling, and Office Departments, as without proper organization no business can hope to withstand the severe competition of to-day.

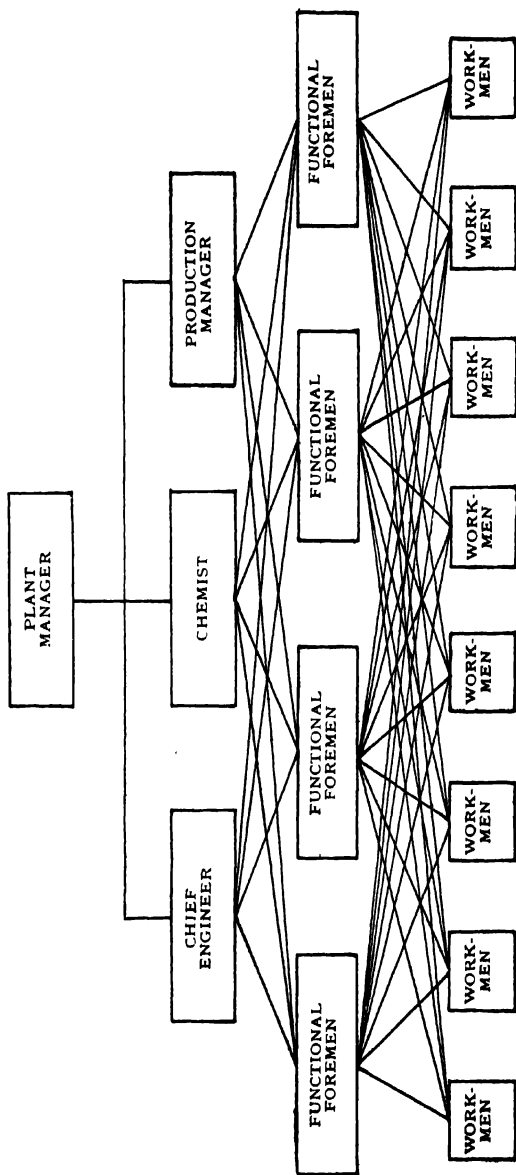
1. **FUNCTIONAL ORGANIZATION.** This type of organization makes the greatest use of the knowledge of experts in their respective fields. Manual and mental work is subdivided to enable expert knowledge on the important matters connected with the industry to be transmitted to the respective departments or individuals. As an example, if this type of organization is applied to the manufacture of, say, paint, there would be made available the expert knowledge of a chemist, and an engineer, as well as a production manager to the foremen of the manufacturing departments and who in turn would transmit such information to the workmen.

The chart on page 293 illustrates the principles of this type of organization.

This type of organization has many advantages, but they are more than outweighed by the disadvantages. It encourages weak discipline and makes it almost impossible to co-ordinate the many separate functions of a business. One will rarely find this type of organization in use.

2. **LINE ORGANIZATION.** This is sometimes called the

CHART SHOWING PRINCIPLE OF THE FUNCTIONAL TYPE OF ORGANIZATION



"Military Type" and is perhaps the oldest form of organization in existence. It is claimed that clear definition of duties and responsibilities and its simplicity are the advantages of such an organization. The principle of Line Organization is that the work of administration is performed by those in higher command and that all other duties are delegated to subordinates. Authority is clearly defined from the management down to the worker. The responsibilities and duties are delegated from the management to the foremen and from the foremen to the workers, but no foreman has any control or authority over another foreman, neither is a worker responsible to any foreman other than the one immediately above him.

The disadvantages of this type of organization are that it is inflexible. In the case of the large and more complex type of business it is most difficult to operate. It has a tendency to overload some employees with responsibilities and may encourage inefficient methods. Another serious objection is the disorganization to the business that invariably follows when the chief executive is lost. The Chart on page 295 illustrates the principles of Line Organization.

3. LINE AND FUNCTIONAL ORGANIZATION. The best features of both types 1 and 2 have been developed into a method to combine all the advantages of each, the general principles being to divide a business into its primary functions which in the case of an average size engineering concern would probably be: (1) Manufacturing, (2) Selling and Distribution, (3) Accounting and Finance. In the case of the larger concern the division of functions would be more detailed and may comprise in addition to the above, Purchasing, Chief Engineer (for design and tests), Advertising, if considerable sums are spent upon this item, and Secretarial, etc.

The executives in charge of each functional division are equal in authority and each has definite duties and responsibilities. Expert advice is also provided for under this method, and the Chief Engineer, Sales Manager, and Comptroller will each give advice to the Plant Superintendents, etc.

It is this type of organization that is chiefly used as a basis for describing the various methods of Cost Accountancy in this Dictionary and a proper understanding of the general principles is necessary.

The chart facing page 295 is given to illustrate the line and functional type of organization.

The chart is interesting because it shows an organizational set-up designed by the author for a firm engaged upon the

manufacture of synthetic rubber. This firm is the largest on the American continent, and primary and secondary functions had to be clearly defined. The principles of the Line Organization were then applied, and definite responsibilities defined and placed in their respective positions on the organization chart in order that each function would be properly directed by an expert in the particular function. Responsibilities and duties are thus clearly delegated from the management to the foremen and, finally, to the worker on the production line.

A more detailed consideration of the manner in which manufacturing departments are dealt with will be found under the heading "DEPARTMENTS—CLASSIFICATION OF." Correct departmentalization is a necessity for all types of Cost Accounting Systems. The organization of the office departments will not present any difficulty if it is realized that an office is a necessary link between the manufacturing, selling, and financial divisions of a business, and that no one division can function properly without it. All the details of a business are worked out in the office, yet an office can only function properly if it realizes that its object is to render a service to the manufacturing, selling, and other divisions and not to control or to determine policies for them. Office Managers can only be efficient if they realize that their ability to originate ideas is not to be directed towards the determination of policies for the business, but towards the invention of ways that will aid them in rendering better service to the management and the various divisions of the business.

It is regretted that the space available does not permit of this subject being dealt with in greater detail, but it is hoped that sufficient has been given to enable one to obtain a general knowledge of the principles of organization and management.

OUTPUT—BASING EXPENSES ON MINIMUM, MAXIMUM, NORMAL OR REDUCED. (See ESTABLISHMENT EXPENSE.)

OUTPUT BONUS. (See BONUS ON OUTPUT.)

OUTPUT COSTING. (See SINGLE OR OUTPUT COSTING, also COST FINDING—METHODS OF.)

OUTPUT STANDARDS. (See STANDARD COSTING.)

OUTWORKER'S TIME SHEET. The nature of some industries is such that employees are sent away from the factory to work upon a customer's site, and in these cases an outworker's time sheet, ruled similar to the specimen given on pages 297 and 298, will be used. The use of an outworker's time sheet is necessary when the work to be done on the customer's

OUT]

DICTIONARY OF COSTING

[OUT

Form No. 65 (Front).

OUTWORKER'S TIME SHEET

Name..... No.
Rate

W.O. No..... Week Ending.....

Particulars of Work.....

	On.	Off.	Foreman's Signature.	Ordinary Time.	Over- time.
FRIDAY . . .					
SATURDAY . . .					
SUNDAY . . .					
MONDAY . . .					
TUESDAY . . .					
WEDNESDAY . . .					
THURSDAY . . .					
TOTAL FOR WEEK					

	Hours.	Rate.	£	s.	d.
ORDINARY TIME . . .					
OVERTIME					
EXTRAS PER OTHER SIDE					
DEDUCTIONS—					
TOTAL			£		

[OUT]

DICTIONARY OF COSTING

[OUT]

Form No. 65 (Back).

OUT WORK EXPENSES SHEET

Job..... W/O.....

Week Ending.....19.....

	£	s.	d.
Railway Fares from			
to			
.....			
Out Door Allowance.....			
.....			
Stamps, Telegrams, etc.			
Extras (if any) to be stated in detail and Receipt for same attached			
.....			
.....			
.....			
.....			
.....			
.....			
.....			
.....			
.....			
Signature.....			

site is of short duration, and where only a few men are required, but with large contracts, extending over a long period of time and requiring a large number of men, it will then be desirable to install time recorders on the site and for the men to use clock cards as would be done in the case of a worker engaged in the factory.

When outworkers' time sheets are used, they will be sent to the Wages Department of the factory at the end of each week and dealt with there in a similar manner as the gate cards, excepting that in this instance the workers may be paid on the site instead of at the factory.

In the case of a large contract being carried out which will extend over a long period of time, a time clerk is usually stationed on the site to supervise the recording of time. In these instances the time clerk will calculate the times and amount of pay, etc., and prepare a statement of the total wages required, which is sent to the factory. The amounts will then be made up and placed in their respective envelopes or pay boxes, and the workmen paid on the site. The back of the outworker's time sheet may be ruled to accommodate a statement of the travelling and incidental expense incurred by each worker.

OVERDRAFTS—EXPENSES OF. (See BANK OVERDRAFT.)

OVERHEAD EXPENSES. (See ESTABLISHMENT EXPENSE.)

PARAMOUNT SORTING SYSTEM. The Paramount sorting system is a simple and most inexpensive method of sorting and classifying all forms of data, from small job tickets, time cards, and stores requisitions to the comprehensive analysis cards essential to the present-day methods of scientific management. Whilst the method is worked on the punched card principle, it differs considerably from the "Powers-Samas" and "Hollerith" systems—

1. The cards are provided with a series of holes perforated adjacent to the edges, each hole representing a definite value in the group allotted to a certain classification. The holes vary in number according to the number of classifications into which it is desired to assemble the cards, and the particular hole or holes, corresponding to the information to be indicated, is slotted away to the edge of the card, this slotting being equivalent to the punching of holes in the body of a card by the "Hollerith" or "Powers-Samas" systems.

2. No machinery for sorting is necessary, as this operation is carried out by hand, and at more than twice the speed of machine sorting.

Paramount sorting is effected by taking a stack of cards which have been slotted into various classifications, and passing a stiff wire, such as a knitting needle, through the holes in the cards, corresponding to the classification (Fig. 15), and raising the wire ; those cards in this classification having nothing to support them, fall clear of the remainder. This is a very rapid process, as a large number of cards fall together ; the cards being sorted at the rate of 60,000 per hour.

3. The system provides an absolute and visible check on the accuracy of sorting—when cards of a given classification have been separated from the remainder, and are tapped into alignment with each other, the slotted holes show up as grooves cut along the edge of the stack, as shown in the illustration (Fig. 16). Any card of a different classification which may accidentally have got into the stack is therefore immediately disclosed by breaking the line of the groove—thus providing the visible check.

4. When cards are filed away in numerical sequence or code order, the slottings which show up as grooves automatically provide a visible index, as will be seen on reference to Fig. 16—guide cards being unnecessary, as the position of the grooves indicates the separate divisions.

5. No special tabulating machinery is required for summarizing or tabulating the results, as this can be done either by hand or with the aid of any existing adding or listing machine.

6. There is no restriction as to the size or shape of the forms that can be used with this method, or even the quality or class of material from which they are made ; for instance, cards as small as railway tickets or sheets of paper—size 10 in. by 8 in. and over can be used : furthermore, the system can be utilized for the sorting of metal or fibre pay and time checks, etc.

The slotting of the cards or forms may be done in various ways, the simplest form being the ticket nipper, similar to those used by railway ticket inspectors, or letter perforators, which can be set to cut out definite codes of one or more figures, and are suitable to issue to workers for the purpose of slotting their identity codes in piecework or job tickets. Where the cards have to be slotted in large quantities, and can be brought to a central point, it is preferable to have a multiple key punch. By this means cards may be slotted into six or seven classifications at a speed of 1,200 per hour.

When the system is used in connection with time cards,

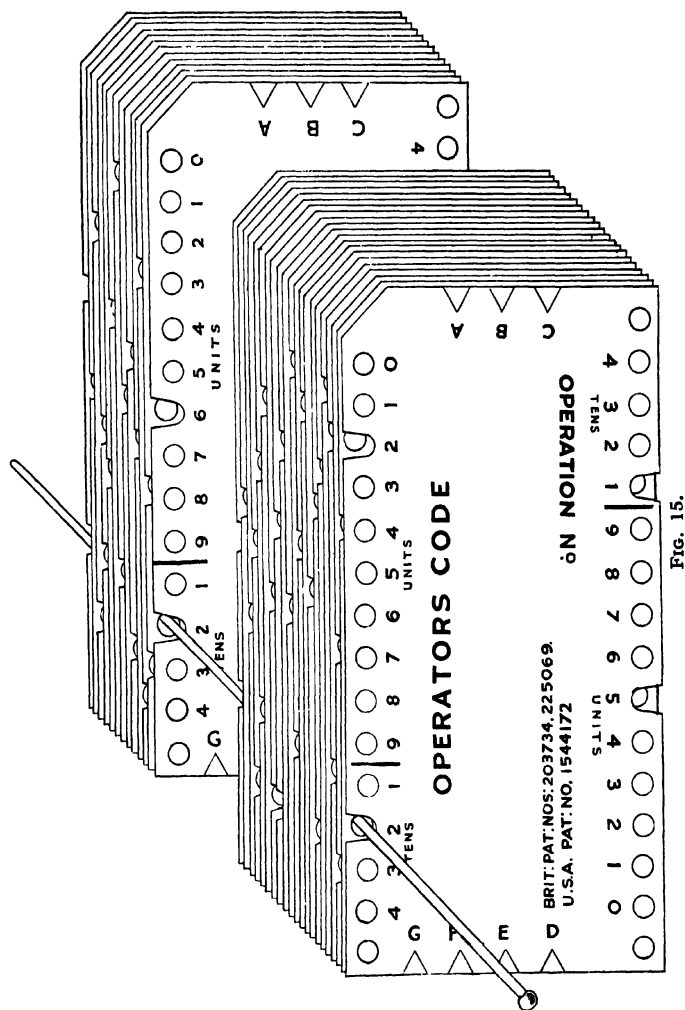


Fig. 15.

job cards, or piecework tickets, it is in many instances possible to slot the cards with the workers' codes before they are issued to the workers. For this purpose a simple form of grooving machine—namely, a single knife driven by a foot or hand lever, can be used to groove 200 cards at a time. This machine is capable of slotting 110,000 cards per hour with single figure codes.

In certain instances the holes or perforations may be slightly nicked towards the edge of the card, and in such cases the

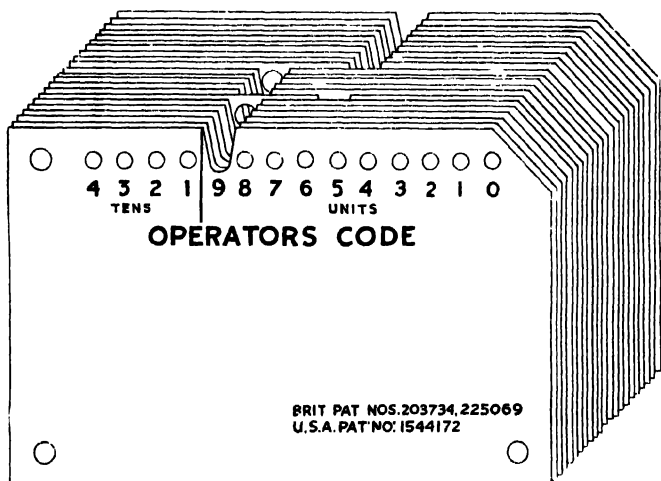


FIG. 16.

slotting is then effected by placing the point of a pencil in the hole and pulling away the nicked portion of the card, thus opening out the hole for the purpose of sorting.

The Paramount method of sorting requires the use of codes for each classification, and the material which has to be sorted and tabulated can be coded by either of the following arrangements—

1. By allotting a series of 10 holes for the units, tens, hundreds, thousands, until the desired limit is reached : each series bearing the numbers 0 to 9 under the respective holes. If the size of the card or form to be sorted will not permit of this arrangement, the following may be used—

2. A series of six holes, numbered 0 to 5 inclusive, are allotted for the units, tens, etc., the numbers 1 to 5 being

indicated by single slotting, and the numbers over 5 by double slotting; for instance, the holes 5 and 1 both slotted out indicate 6: likewise 5 and 2 = 7, and so on. This does not involve extra labour in sorting, as by passing the needle through the 5 hole in the first instance, the stack is automatically divided into numbers over 5, and 5 and below.

3. Another variation of the above is to have six holes, five of which are numbered 1, 3, 5, 7, 9, the sixth being lettered X. A slotted hole being normally read as the odd figure printed below it, but when the X hole is also slotted the hole is read as the even figure next below: e.g. X9 = 8, X1 = 0.

4. By having a series of 12 holes, 10 of which are numbered 0 to 9, and two lettered N and R/D, to denote the order of reading, as follows—

○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
9 8 7 6 5 4 3 2 1 0 N R/D.

a complete range of numbers from 0 to 99 is possible.

"N" indicates normal reading.

"R/D" denotes—in the case of double slottings "read from right to left," and in the case of single slottings "read as though the figure has been written twice"—see following examples.

A single hole slotted in conjunction with the "N" will, therefore, be read as the figure printed below normally indicates; if, however, the "R/D" hole is slotted then the figure will be read twice, e.g. 5 R/D = 55.

Double figures slotted in conjunction with the "N" hole should be read from left to right as written figures thus, 8, 5, N = 85; on the other hand, if the "R/D" hole is slotted in place of the "N," the 8 and 5 would be read in the reverse way (right to left), viz., 58.

This can be extended to a second series of 12 holes, making 24 in all, covering hundreds and thousands, which then gives a complete numerical sequence from 0 to 9999.

If the codes need not be kept in strict numerical sequence as identity codes for workers, articles, or for any other purpose which does not necessitate codes running in consecutive order, *with 10 holes* the following codes may be used—

Single Figure Code. By slotting each hole out individually 0 to 9—a code with a series of 10 index figures is provided.

2-Figure Code. By reading the left-hand hole of the two slotted away as the ten and the right-hand hole as the unit—a code of 45 figures may be used, e.g. 10, 20, 21, 30, 31, 32, 40, etc.

3-Figure Code. Reading in the same manner from the left-hand hole as the hundred, the middle hole as the ten, and the right-hand hole as the unit—a code consisting of 120 figures is available—e.g. 210, 310, 320, 321, 410, etc.

4-Figure Code. In the same manner a code of 210 figures is possible, e.g. 3210, 4210, 4310, 4320, 4321, and so on.

If a still larger range is required the above figures may be squared by using a double code, making 20 holes in all, e.g.—

A *single-figure code* in two series 0/0 to 9/9 gives a code of 100 index figures.

By extending the code to two *figures* in the two series from 0/0 to 98/98, we get 3,025 index figures.

By using three *figures* in two series it is possible to obtain 30,625 index figures.

Four *figures* in two series will give 148,225 index figures.

The "Paramount" method is applicable to all classes of clerical work requiring the collection of details into classified form. The work of sorting time cards, job cards, stores requisitions, work tickets, is reduced to a minimum, and by re-sorting into different classifications the laborious process of hand analysis, with its consequent checking, is eliminated.

The procedure followed with regard to the sorting and analysing is very simple, as will be observed from the description which follows of a Costing System used in a large machine shop.

Each works order is given a serial job number, which is entered on a card similar to the specimen given (Form 66), together with the sanction number or departmental code number to which the job is chargeable. These numbers are then slotted along the top and bottom edges of the card, together with certain other information such as date of order and class of work, which is expressed by the code F B C D E S in top left-hand corner; F B C representing orders received during the years 1924, 1925, and 1926; and D E S which relates to orders on the pattern shop, experimental orders, and capital expenditure respectively. The card illustrated relates to job number S 4059, and this reference number is slotted with the "S," indicating that it is a sanction order covering capital expenditure, together with 405 on the principle referred to in number 3 example of coding, described above, the unit figure of 9 in the job number S 4059 is not provided for, it being unnecessary to carry the sorting by mechanical method beyond the tens.

With regard to the holes along the bottom edge of the card.

[illegible]

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
FILER										TRUER									
CUSTOMER										INSPECTOR									
Smith										[Signature]									
SIZE										SIZE CODE									
28" x 4 1/2"										BRIT PAT NOS 203734, 225069 U.S.A PAT NO 1544172.									
CUSTOMERS CODE										CUSTOMERS CODE									
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0

These refer to "M"—work done for a branch factory; "W" works or departmental order; "S" sanction order; 5, 4, and 3, additions, replacements, and alterations to plant respectively. 2 miscellaneous, and 1 general sanctions, the remainder of the bottom edge being reserved for code numbers also arranged on the principle set out in the paragraph numbered 3 on page 303, but in this instance the slottings are read as hundreds, tens, and units, in connection with sanction orders, or as tens and units plus tens and units for the two series of numbers which constitute the works code.

It will be seen that in order to arrange the holes in series suitable for both codes that the 2 holes reserved for the tens in the second series of the works code have been placed to the right of the units

In the case illustrated the "S" has been slotted out to represent sanction order, 5 to denote that the order covers an addition to plant; the 3, X5, X3 to denote sanction number 342.

The values of the materials used on all orders are obtained from the stores requisitions, and the amounts posted each week; likewise the labour expended is posted from the job cards, and the value of the labour balanced with the pay roll weekly.

The costs have now to be analysed according to chargeable codes for the purpose of debiting the Work in Progress Account of each department, with the amount of labour expended and material used during the week in question. This is effected by sorting the cards into chargeable code order, when the items will be automatically assembled ready for totalling, after which the cards are re-sorted into job number order for subsequent postings.

Under the old method this analysis was done by hand; the stores requisitions and time cards being posted to individual job numbers, and an abstract prepared by the use of analysis paper.

The method of sorting is as follows—

The cards are first tapped lightly into alignment and a stiff wire is passed through the "S" hole to divide the cards into sanctions and departmental orders; on raising the wire, all those slotted away at this hole fall clear, and the remainder are carried away on the wire. If the two stacks are now tapped into alignment there will be an unbroken groove running through each stack at the "W" and "S" holes respectively; thus proving that the cards have been

accurately sorted into their respective classifications, viz., works code and sanctions.

Each stack is then sorted into numerical order, starting with the X hole in the hundreds, thus dividing the stack into odd and even hundreds, as already described; the cards are then sorted into the respective hundreds by passing the wire first through the 9 hole and then through the 7 hole, and so on through each of the stacks; the process being

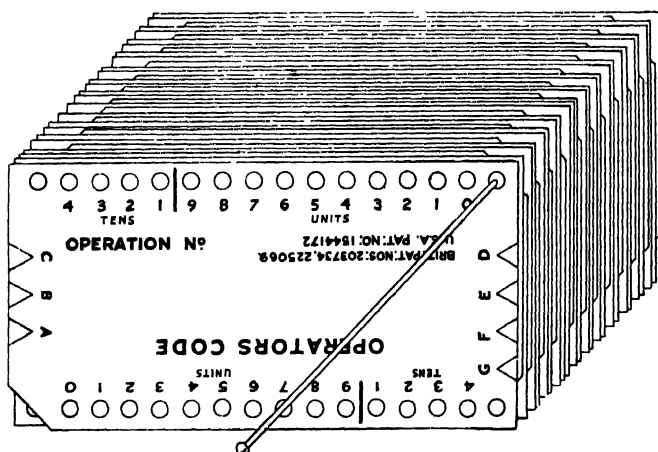


FIG. 17.

repeated through the tens and units, by which time the cards will be arranged in correct numerical order of sanction numbers and works codes.

The above description chiefly shows how the work of analysing the details into classifications is simplified; the card in this instance is made out in the cost office, and does not leave this department.

There has yet to be described the internal routine of the factory, in so far as it relates to the costing system, and in this direction the ticket is usually a form that is very easily adapted to any existing costing system in connection with repetition work. The form illustrated (Form 67) is a job ticket used by a large manufacturing firm. It covers two repetition operations, and forms the basis for calculating piecework earnings, and compiling of job costs and progress reports.

The filers' codes are slotted in advance on the tickets and

issued in bulk. Upon completion of each unit of work, the filers pass the work, together with a ticket to the next operation, viz., truing. The truer, after completing his work, slots his code in the ticket, and passes it on with the work to the inspector. After passing the work, the inspector clips the ticket through his letter code with a special design of ticket nipper, which does not leave his possession, and drops the ticket into a box, the box being cleared periodically throughout the day by the departmental clerk.

The tickets are first checked to see that all have been clipped by the inspector, any not so clipped being rejected. They are then sorted into size and customers' code order, and the progress record written up. The tickets are then sorted into operators' code order, and the number of pieces credited to the workers; the total of pieces and value forming the basis for costing each job or process.

Corner Sorting. In practice the cards or forms may occasionally be received into the office in such disorder or disarrangement that they have first to be placed in correct position or relation to each other for sorting.

For example, the tallies may arrive at the office some with the fronts turned round the wrong way; others turned top downwards, and so on. There are four possible positions, but the arranging of cards into their correct position is speedily accomplished in the following manner—

One corner of each card is cut away, and at each of the other three corners is provided a hole. It will, therefore, be seen that by tapping the cards into alignment all those cards which are not correctly positioned will project beyond the cut away corner of the correctly positioned cards, as shown in Fig. 17. By passing the sorting wire through the corner hole in the projecting cards, such cards are taken away on the wire, and the correctly positioned ones left behind. By repeating this process through the remaining corners the cards are very speedily brought into the correct arrangement for sorting.

PARCELS POST. (See POSTAGE.)

PART FINISHED STOCK. Work in progress that has not reached the stage of completion.

PATENT FEES. The expenses relating to patent fees and renewals form part of the establishment expenses of the business, and are allocated to administrative expenses. In many instances this expense item is allocated direct to the Factory Expense Account, but such procedure is not correct, as the charges incurred in connection with patenting a

Form No. 68 (Front).

[illegible]

Size 8" by 5"

Form No. 68 (Back)

FOUNDRY.				Casting Material.	Pattern Issued.	Pattern Retnd.

ALTERATIONS.					
Date.	No.	Date.	No.	Date.	No.

company's products are essentially an administrative expense, and not a direct charge to the Factory or Sales Department.

PATTERNS—RECORD OF. In many industries, particularly in the case of foundries, engineering concerns, etc., patterns, moulds, dies, etc., constitute an important item among the assets, and a complete record of these articles should be maintained in a similar manner as for machine tools, etc.

Depreciation charges are usually heavy, as also the cost of repairs. Patterns, therefore, should be classified on the same principle as plant, and depreciation rates established for each class.

A card similar to the plant record card is used for recording values, etc. In cases where patterns and dies are sent to outside foundries, etc., an additional record is necessary, so that a complete record of the location of each pattern is obtained. A record card for this purpose is given on page 309, which is self-explanatory.

PAY ROLL. The primary object of a pay roll is, firstly, to provide a medium for summarizing the amount of wages payable to each worker in order that a "total" can be obtained; and, secondly, to form a permanent record of all wages paid each week.

The pay roll, however, can be arranged to provide useful statistics in addition to the above; for instance, the nature of some industries is such that the total wages can be analysed to show the amount per article or the total paid to direct and indirect workers, whereas in the process industries, the analysis may be arranged to give the wages paid for each process and service department.

The illustration given (Form No. 69) is a pay roll which has been designed for use on the loose-leaf principle, and can be arranged to give either a departmental or process analysis as well as the wages paid to each service department. When this form of pay roll is used, a separate sheet will be required for each department or process, and the total of each summarized on a separate sheet.

From this summary numerous statistics can be compiled; for instance, the average number of hours per worker is obtained by adding the hours in the "number of hours" column and dividing the total by the number of workers on the pay roll, such a figure being calculated per department or process, etc., according to the information desired. The average earnings per worker can also be ascertained by dividing the total wages by the number of workers. This

average figure can be calculated either for ordinary wages, overtime, bonus earnings or gross or net amount of wages paid.

With those concerns which employ a large number of youths and apprentices, etc., it is desirable to use a separate sheet for each class of worker if the above or similar average figures are to be calculated.

The choice of any ruling of pay roll will naturally depend upon the amount of information required from this record, and also the extent to which the wages are analysed by the system of service orders. For instance, if the pay roll cannot conveniently be arranged to give the desired analysis, it will then be necessary to obtain this analysis by means of a system of service orders. In such cases it is then usual for the pay roll to give a more or less general analysis of direct or indirect wages, departmental or process, etc. (See also illustration of pay roll on page 349.)

PAYMENT BY RESULTS. Remuneration of labour for increased effort, usually by means of piece work, premium bonus, or other incentive plan. (See WAGE INCENTIVE.)

PERCENTAGE ON DIRECT LABOUR METHOD OF RECOVERING EXPENSES. The computation and recovery of expenses on the basis of direct labour value is perhaps the most common method used, and its popularity is no doubt due to its extreme simplicity. With this method the expenses are recovered as a percentage on the direct labour cost of each article, order, or process, and the calculations necessary to arrive at the percentage rate to be used may be expressed by the following formula—

$$\frac{\text{Estimated total factory expenses for the period} \times 100}{\text{Estimated total direct labour for period}}$$

The principles involved in estimating the total expenses for the year are fully dealt with under the general consideration of establishment expenses.

The predetermination of the total direct wages for the year or other period is based upon the normal maximum output of the factory, and a close estimate can only be arrived at when all the factors which enter into the estimate are dealt with individually and upon a scientific basis.

1. Estimating Output. The normal maximum output is the total output that should be obtained, assuming that the factory will be working full ordinary time throughout the period and at a reasonable rate of efficiency. The estimate

in the first place will require that the plant be examined and a standard rate of output fixed for each department, process or group of machines on this basis. This examination of the plant, etc., may not be necessary in all cases, as most factories will have been correctly departmentalized, but in those instances where a factory is not well organized, it will necessitate that each operation or class of work be listed together with the number of machine tools, etc., available in each group, and the possible output capacity ascertained in consultation with the works manager or production engineer.

2. Estimating Number of Direct Workers. The lists prepared in connection with 1 above should be arranged in order of department, operation or process, so that the next step, which is to estimate the number of direct workers necessary to give the required output or to "man" the respective machine tools, can be dealt with as a natural sequence to the figures obtained from 1 above.

3. Estimated Wages of Direct Workers. The lists being arranged in order of departments or operations, they will automatically give the trades of the respective workers, and the estimate of the total direct wages can now be completed. The average weekly pay for direct workers engaged in the respective trades is easily ascertained from the pay roll, if ruled similar to the specimen given on page 311, and the final estimated figure is now obtained by multiplying the number of workers as ascertained under 2 above by the average weekly pay for the normal working week.

When estimating the number of working days in a costing period, due allowance should be made for holidays and time lost for various reasons. The general practice in this direction is to regard a year as 50 weeks of $5\frac{1}{2}$ working days each, less an allowance for lost time.

The time lost for various reasons should be obtainable from the pay roll or other record, and expressed as a percentage rate on the total possible number of hours.

It will be seen from the above that the correctness of the percentage rate which is finally arrived at will depend upon three factors, namely—

1. The estimate of the factory expenses for the ensuing period ;
2. The estimate of the quantity of goods that will be made and their factory cost ;
3. The estimate of the amount of direct wages ;

and unless these estimates are prepared scientifically, serious errors may occur. In some instances, however, the expenses and direct labour of the previous year are taken as a basis for the ensuing period, but this method cannot be seriously recommended.

Assuming that from the estimates prepared as above the total factory expense is £151,050, and that direct labour amounts to £159,000, the expense rate would therefore be—

$$\frac{£151,050 \times 100}{£159,000} = 95\%$$

The amount of factory expenses to be recovered on each job would, therefore, be ascertained by adding a figure which would be equal to 95 per cent of the direct labour as follows—

	£	s.	d.
Direct Labour	107	-	-
Direct Materials	123	-	-
Prime Cost	230	-	-
Factory Expenses—			
95% on Direct Labour	101	15	-
TOTAL FACTORY COST	£331	15	-

This method is extremely simple to operate and if all the workmen are paid a uniform rate and if they all work under similar physical conditions, it will give fairly accurate results, as the workers' earnings are the basis of calculation, and not the time taken or equipment used to complete the work when machinery and equipment are used.

One of the main objections to the method is that no allowance is made for a job which requires the use of expensive machinery, or for a job which may be all hand work. This is a serious fault, because the article or process which requires the use of machinery should have charged to it a greater proportion of the factory expenses than one which requires the use of little or no machinery.

A further objection to this method is that no allowance is made for the time taken to complete a job, as the following examples will show—

Assume a department where all bench work is carried out, and that the workers are paid by the piece work method. Two men are each given a job, the piece work price being 25s.

for the job in each case. If worker No. 1 completes his task in 10 hours and worker No. 2 in 15 hours, the amount of factory expense to be added to the cost will be the same for both jobs, despite the fact that worker No. 2 made use of his bench, tools, and supervision, etc., for a longer period than worker No. 1. However, had these men been paid by the day rate system, a difference in cost would be shown in each case—

WORKER NO. 1.			TIME TAKEN, 10 HOURS		
<i>Piece Work Method.</i>			<i>Day Rate Method.</i>		
	£	s. d.		£	s. d.
Materials	1	10 -	Materials	1	10 -
Direct Labour . .	1	5 -	Direct Labour at 2/6		
Factory Expenses (say			per hour	1	5 -
100%)	1	5 -	Factory Expenses		
			100%	1	5 -
	£4	- -		£4	- -

WORKER NO. 2.			TIME TAKEN, 15 HOURS		
	£	s. d.		£	s. d.
Materials	1	10 -	Materials	1	10 -
Direct Labour . .	1	5 -	Direct Labour at 2/6		
Factory Expenses—			per hour	1	17 6
100%	1	5 -	Factory Expenses—		
			100%	1	17 6
	£4	- -		£5	5 -

The above examples clearly illustrate that the results obtained from this method are very inconsistent.

As a further illustration, the manufacture of paint offers a very good example. In a certain process the quantity of raw materials used is absolutely fixed, and any variation of the purchase price on the materials is easily computed. The workmen in charge of the machines regularly produce 12 cwt. per hour and are paid on a piece work basis. The direct labour cost amounting to 5s. per cwt., factory expenses are fairly heavy at 150 per cent on direct labour. The cost may, therefore, be stated as follows—

	Per Cwt.		
	£	s.	d.
Materials	1	17	6
Labour		5	-
Factory Expenses		7	6
	£2	10	-

A time study was made and it was found possible to reduce the running time per machine by 20 per cent. Under these new working conditions the raw materials and direct labour were as before, but, owing to the fact that less time is now taken, the factory expenses are reduced by about 1s. 6d. per cwt. If expenses are recovered as a percentage on direct labour, no alteration in the cost of this particular process will be shown, in spite of the fact that the output is increased by reducing the time taken for the operation.

The basis of the percentage on direct labour method being a worker's earnings, and not the time taken or equipment used, reduces its value considerably, because accurate results are only obtainable under very exceptional circumstances. Uniformity of pay and working conditions rarely exist throughout any one factory and the method should, therefore, only be used for those departments of a factory where the special conditions justify its adoption.

The examples given above clearly illustrate that the special conditions of each factory will require the most careful consideration before any particular method or methods can be finally selected.

PERCENTAGE ON PRIME COST METHOD OF RECOVERING EXPENSES. The method of computing and recovering expenses on the basis of *prime cost* is very similar to the percentage on direct labour method, excepting that the expenses are calculated on the total direct labour and direct material costs of each job, operation or process, instead of on the amount of direct labour only.

The calculations necessary to arrive at a percentage rate may be expressed by the following formula—

$$\frac{\text{Total factory expense} \times 100}{(\text{Total direct labour} + \text{Total direct materials})}$$

The accuracy of the prime cost method depends upon the correctness of the percentage rate established, and the rate may sometimes be calculated upon the actual expenses and costs of previous years, or an estimate prepared either upon a reduced output or the full normal output capacity of the factory. The advantages and disadvantages of each of these methods of estimating expenses are dealt with under the heading of "estimating expenses," also "establishment expense."

As an example, if the total factory expenses over a period were estimated to be £85,200, and the total direct labour used

and direct materials consumed in production were £69,300 and £72,700 respectively, the percentage to be used for recovering expenses in costs would be—

$$\frac{£85,200 \times 100}{£69,300 + £72,700} = 60\%$$

The amount of expense to be recovered on each cost would, therefore, be ascertained by adding a figure which will be equal to 60 per cent of the prime cost, as follows—

	£	s.	d.
Direct Labour	98	-	-
Direct Materials	95	15	-
	<hr/>		
	193	15	-
Expenses (60%)	116	5	-
	<hr/>		
TOTAL COST	£310	-	-
	<hr/>		

With small manufacturing concerns the prime cost method is often used owing to its simplicity, but in the majority of cases the percentage rate is fixed more by business custom, consequently the amount added to prime cost depends largely upon what figure a competitor is using in the same line of business when arriving at a selling price rather than upon the actual facts.

In those cases, however, where a standard article is made and the labour and material costs are constant, and the process of manufacture is such that an equal value of the materials enters into the article at each stage or department, the method may be used with a fair amount of success. With those concerns making a variety of articles, however, and where certain of these articles only pass through a few departments, whilst the remainder must proceed through all processes of manufacture, the resultant costs will be very inaccurate, as no allowance will be made for the time taken to complete each process or article, or for those departments that use machinery and those which do not.

This method can seldom be applied on a departmental basis, because the value of materials used by each department will rarely form an equal part of the cost of every department through which the product passes; furthermore, the costs of a department may only comprise labour and expenses, and in such a case the prime cost method could not be adopted.

It will, therefore, be seen that this is perhaps one of the most inaccurate methods, because expenses rarely, if ever, have any direct relation to the value of materials used, and

possesses in addition to the above faults all the disadvantages which attach to the percentage on direct labour method.

PERCENTAGE ON SALES VALUE METHOD OF RECOVERING SELLING EXPENSES. (See SELLING AND DISTRIBUTION EXPENSE.)

PERCENTAGE ON WORKS COST METHOD OF RECOVERING SELLING EXPENSES. (See SELLING AND DISTRIBUTION EXPENSE.)

PERPETUAL INVENTORY. A method of recording stock balances after every receipt and issue in order that the balance on hand of each item of stock shall be known. (See STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES, STOCK RECORD CARD, BIN INSPECTION.)

PIECE RATE. (See PIECE WORK.)

PIECE WORK (also known as **Piece Rate**, **Straight Piece Rate**). The essential difference between this method and payment by time is that here there is a bargain between the employer and the worker that in return for a specified payment the worker will perform a definite quantity of work. He is not paid for his idle time, unless he is idle because of shortcomings on the part of the management, such as non-provision of the necessary material for carrying out the worker's part of the bargain, or no work ready for him to do. The worker is expected to conform to the usual works routine and regulations, but there does not appear to be a legal right on the part of the employer to fine him for tardiness or absence. The piece rate does take into consideration varying standards of accomplishments, the industrious worker being rewarded in exact ratio to his increased effort. There is also a distinct tendency to increased output because of the incentive now offered. The employer benefits by a decreased cost, his expenses being distributed over a greater output, resulting in a lower unit cost. Again, there is an improvement in quality, as the worker being paid only for that work which passes inspection, he is more careful in his scrutiny of the materials supplied to him, enabling faulty material to be rejected at an earlier stage. In his desire to increase his output, the worker frequently devises quicker and better methods of carrying out the process upon which he is engaged. Where piece rates are in force, the manufacturer is in a happy position in knowing his labour cost, and thereby in a better position than under the time rate in making quotations for contract. One other advantage is that once again we have a simple method for computation.

As a set-off against the foregoing advantages, there may be stated two serious difficulties which are inter-related—they are the questions of rate setting and what is known as “cutting.” It will be convenient to deal with these simultaneously. One of the gravest criticisms that can be levelled against this method of remunerating labour, as usually employed, concerns the fixing of a just and equitable rate.

The usual method of fixing a rate has been to turn up past records, and to find something as nearly as possible the same as the process to be rated, and then frankly to guess at what it is considered the worker will accept. For new work which is outside the experience of the employers or their rate fixers, the guess is an absolute leap in the dark. It can readily be imagined that in these circumstances the chances are even that the rate will be too high or too low. Where the rate is too high, the workman makes so much money as to startle the employer, who has the feeling that there is an upper limit to a worker's earnings. At this point comes the “cut,” that is, the piece rate is reduced. The worker sets out at the new rate, again based on little or no information, and by dint of hard work or, perhaps, through having discovered a quicker method of performing the operation, once more makes high wages. Yet again the cut, and so on *ad nauseam*. There comes a point when the worker realizes that no matter how hard he may work, or how inventive he may have been, it is not intended to allow him to earn more than time and a quarter or at the very outside time and a half. The inevitable consequence follows that, no matter what piece rates are set, workers spin out their time and never attempt to earn more than time and a quarter or time and a half.

The fault lies entirely with the rate setting, a discussion on which will be found under that heading.

There is one other circumstance in which piece rates are unfair to workers, who often suffer through no fault of theirs. Material may be faulty, machinery in bad condition, or poor management may cause long delays and stoppages. It is evident that if an employer accepts the principle of piece rates, it is his duty to see that there is no waiting for material, that his organization is effective, eliminating all delays, and that all tools and equipment are maintained in the best possible condition.

Given these conditions and with rates scientifically, accurately, and justly set, the straight piece rate would be an

excellent system in those industries where the nature of the products made justifies its adoption. (See also WAGE INCENTIVE.)

PIECE WORK EARNINGS—RECORD OF. The piece work earnings of employees are usually recorded in such a manner that any abnormal earnings on the part of individual workers in respect to identical operations can be notified to the Planning, Progress or other Departments. The reporting of abnormal piece work earnings is important, as it enables the departments concerned to investigate such items with a view to taking the necessary steps for the rectification of any errors that may have been made in the fixing of the original times and rates, etc.

The ruling of such forms will be very similar to the illustration given in connection with the record of premium or bonus earnings, excepting that the headings of the various columns will be arranged to suit the piece work method of payment. For instance, it may be necessary to show the number of pieces that should be completed within the stipulated time, the actual quantity finished, and the piece work rates.

In addition to the above, suitable space should be provided for noting any changes made either in regard to the time allowed, number of pieces or rates, or method of manufacture, in order that a complete history is obtained. Separate cards may be allocated to each article or component or to each operation, according to requirements.

The information posted to this record is obtained from the respective job cards or piece work tickets.

PLANT. The term "plant," also "plant and machinery," is very often used when referring to the various assets of a concern other than tools and buildings. The plant assets will, therefore, comprise producing machinery, i.e. machine tools which are permanently fixed in position as distinct from bench tools, etc., also power plant, heating plant, and other forms of special plant such as case hardening plant, drying ovens, smithy, compressed air plant, etc.

With most concerns a distinction is necessary between plant and machinery, and that given above will be found suitable for the majority of factories.

For a classification of both plant and machinery items, see SERVICE ORDERS.

PLANT ADDITIONS. (See SERVICE ORDERS.)

PLANT AND MACHINERY ACCOUNT. (See PLANT RECORDS.)

PLANT—DEPRECIATION OF. The amount of depreciation on all kinds of plant is a charge to establishment expenses, and the item dealt with in detail according to the kind of plant and the method of costing in use. For instance, the amount which relates to the plant used for the generation, supply and transmission of power may be charged to the Power Department, if the object is to ascertain the total expense of that service department.

When the plant assets consist only of electric motors or other forms of prime movers, the amount of depreciation will be charged to the departments where they are installed; alternatively, the expense is apportioned on the basis of horse-power consumed when one power unit serves several departments.

Heating Plant. The depreciation on this kind of plant is usually charged to the one account, which also receives debits for the various other expenses incurred by this service department the object being to ascertain the total cost of heating, this being finally allocated to the respective departments on the basis of cubic area. With small concerns the amount of heating plant in use may not warrant this treatment, and the amount of depreciation is then dealt with according to the method of recovering expenses in costs; for instance, if the percentage on direct labour method is used, the depreciation charge is simply apportioned over the Factory and Selling Departments, whereas with the machine rate method the amount will require to be further analysed to the respective producing departments.

The treatment of depreciation in the cost accounts follows on very much the same lines as for repairs and maintenance charges, to which reference should be made respecting the various other forms of plant (See also DEPRECIATION.)

PLANT RECORDS. The amount of expense incurred in connection with the repair and upkeep of all plant and machinery will be a very big item with some concerns, and a detailed record of each piece of machinery is desirable. The amount of capital expended in the purchase of plant is usually debited to one, or perhaps two accounts in the financial books, and a complete inventory of each item should be made by means of a "plant record card."

The advantage of using cards is that it enables the inventory to be arranged and kept by departments or other form of division, so that when machines are transferred from one department to another or to a different part of the factory,

the record card can be moved accordingly; likewise when a piece of machinery has become obsolete, its card can be removed from the drawer and filed among other "obsolete" cards.

The advantages obtained from the use of plant records may be summarized under the following headings—

1. Shows the book value of the individual items of plant.

2. Provides a check on the total capital value of assets which appear in the financial accounts.

3. Provides a system for recording the repairs, maintenance, and depreciation charges.

4. Enables depreciation rates for each class of machine to be accurately ascertained.

5. Provides the basis for gauging the efficiency of the respective types of machine tools when considered in conjunction with production statistics.

6. Enables correct values to be fixed in connection with insurances and the assessment of losses due to fire, etc.

When detailed records of plant have not been maintained, it will be necessary to prepare a complete list of all machinery and to classify and value each item, numbers and symbols being then assigned and painted on each machine tool. A plant record card is then made out for each item, and full particulars entered thereon as to the makers, date received, total cost, location, and depreciation rates, etc., and the card filed in order of machine number under its respective department or group.

A specimen plant record card is shown on page 322, and which is designed to contain the above particulars, also the cost of all repairs, etc.

The cost of repairs and maintenance when done on the premises, will be ascertained by means of service orders, or from the maker's invoice if carried out by them, and the total each month posted to the respective record card.

Depreciation will be entered upon the card each month or other period, according to system, the "total" columns added and the balance carried down. The repairs and maintenance, also depreciation, columns are not added until the end of each year, as it will be necessary to ascertain the total amount that has been posted to each card for the purpose of making any adjustment that may be necessary between the actual amount of repair charges and depreciation as obtained from the cost records, and the amounts

included in the annual Profit and Loss Account and Balance Sheet.

Similar records to the above should be kept for all other assets, including large tools, but records of small perishable tools, such as files, hammers, small drills, etc., should be separately maintained by the tool stores.

(See also REPAIRS AND MAINTENANCE.)

PLANT—REPAIRS AND MAINTENANCE. The total expense of maintaining and keeping in good repair all plant used for the generation, supply, and transmission of electric or other power is a charge to the Power Department, the object being to ascertain the total expense of this service department, so that the producing and other departments of a business can be debited with the cost of power, etc., consumed by them.

On the other hand, if electrical energy is purchased outside and the plant assets only comprise electric motors or gas engines, etc., the cost of maintenance may either be charged to the departments where the power units are installed, or, in cases where one motor serves more than one department, the expense is apportioned on the basis of horse-power consumed by the respective departments.

Repairs and maintenance charges are sometimes taken into consideration when establishing a depreciation rate for the power plant, and in such cases the repair expense will be charged to the Reserve for Depreciation—Plant Account. (See also REPAIRS AND MAINTENANCE and SERVICE ORDERS.)

PLANT—UPKEEP OF. (See SERVICE ORDERS.)

POSTAGE. Expenditure in connection with the postage of correspondence, also parcel post, is included in establishment expenses. This item is then apportioned to factory, selling, and administration, according to the extent to which it is estimated the expenditure is incurred by each section of the business.

In cases where separate mailing departments are used, the actual expense for each section is ascertained and charged direct to the Factory or Selling, etc., Expense Accounts

Parcels post should be treated quite separately from the money expended on letter post, and the expense in this direction transferred to "carriage outwards" and included among selling expenses.

POWER EXPENSE. The total expenditure incurred in the generation, supply, and transmission of power.

The power expense of a factory may be subdivided according to the kind of power generated or used, such as—

STEAM—

Raising.

Distribution.

ELECTRICITY—

Generation.

Distribution

Transmission.

COMPRESSED AIR, ETC.

The various items which go to make up the total power expense of any business will depend upon the kinds of power generated and the type and amount of machinery used, and the following statement will give a general idea of the expense items that may be included—

FUEL—

Coal.

Cartage on coal.

Wharfage on coal.

Oil.

WATER.

MISCELLANEOUS SUPPLIES—

Oil.

Waste.

Sundries.

SALARIES AND WAGES—

Chief engineer.

Assistant engineer.

Firemen.

Boilermen.

Oilers and wipers.

Attendants.

Coal handling.

Ash removal.

ADMINISTRATIVE EXPENSES (portion transferred from administrative expense).

REPAIRS AND MAINTENANCE—

Boilers.

Conveyors.

Condensers.

Economizers.

REPAIRS AND MAINTENANCE—(*contd.*)

Electric generating plant.
 Electric transforming plant.
 Electric distribution system.
 Transmission plant.
 Compressed air plant.
 Electric lighting system.
 Hydraulic system.

DEPRECIATION ON EACH KIND OF PLANT.

INSURANCE " " "
 RATES AND TAXES " " "

The apportionment of certain of the expense items, such as depreciation, rates, etc., can only be dealt with on a logical basis if the capital value of each type of plant is kept separately or classified accordingly.

It is important that a true cost of the respective kinds of power generated and used be obtained, as it will not only form the basis for charging the Producing and Service Departments with the power consumed, but will enable a business to compare the cost of its own power with that of outside services.

The distribution of the power expense to the respective Service or Producing Departments is usually made at the end of each month by ascertaining the total cost of each power service and charging the departments according to the actual consumption.

The charges to the respective departments may be transferred direct from each of the Power Expense Accounts, or the total cost of the various forms of power entered on a combined statement, and a summary of the amounts chargeable to each department or service shown at the foot of the combined statement. (See also SERVICE ORDERS.)

SUMMARY OF POWER EXPENSE

Steam Raising	£	3,500	
Steam Distribution.		250	
			3,750
Electricity Generation		2,900	
Electricity Distribution		750	
Electricity Transmission		1,500	
			5,150
Compressed Air		500	500
TOTAL POWER EXPENSE			<u>£9,400</u>

DISTRIBUTION OF STEAM EXPENSE

DESCRIPTION.	Lb. of Steam.	£	s.	d.
Electricity Generation, etc.	6,750,000	2,812	10	—
Heating	400,000	166	13	4
Drying Ovens	230,000	95	16	8
Baking Ovens	300,000	125	—	—
Steam Hammers	520,000	216	13	4
Pumps, High Pressure	490,000	204	3	4
Pumps, Foundry	280,000	116	13	4
Miscellaneous	30,000	12	10	—
	9,000,000	£3,750	—	—

DISTRIBUTION OF ELECTRICITY EXPENSE

	£	s.	d.
Electric Power Expense	5,150	—	—
Service Charge—Steam	2,812	10	—
TOTAL	£7,962	10	—

DESCRIPTION	Kilowatt Hours.	£	s.	d.
Machine Tools (analysed to each group of machines or departments)	15,288,000	6,370	—	—
Compressed Air Plant	1,528,800	637	—	—
Lighting (analysed to departments)	764,400	318	10	—
Electric Cranes	1,320,000	550	—	—
Electric Welding	348,000	87	—	—
	19,249,200	£7,962	10	—

DISTRIBUTION OF COMPRESSED AIR EXPENSE

	£	s.	d.
Compressed Air Expense	500	—	—
Service Charge—Electric Current	637	—	—
	£1,137	—	—

(The distribution of compressed air is usually noted at the foot of the account summarizing the cost, as the total is charged to machine tools or Tool Expense Account.)

POWERS-SAMAS ACCOUNTING MACHINES. PUNCHED CARD METHOD. This Punched Card Accounting System is a completely mechanized system, in which machines

perform the three fundamental operations involved in all costing and accounting work, viz. the recording of the original data; sorting such data to the various kinds of classified groups; printing the data into the appropriate account. The recording of the original data consists of translating information from the original documents into a form in which it can be handled mechanically, i.e. the Powers-Samas card. This is a thin flexible card of standard size and quality in which the information is represented by holes punched in it, the position of the holes determining the information it is desired to record.

These cards, having been punched, are then permanent records which can be mechanically sorted, printed and added; and since the punched holes cannot vary their position, the cards must always reproduce accurately the figures and information they contain.

Three ranges of Powers-Samas equipment are available: the Powers-One machines, which employ a card $2\frac{3}{4}$ in. by 2 in.; the Powers-Four machines employing a card $4\frac{1}{2}$ in. by 2 in.; and the Powers-Samas machines using a card $7\frac{3}{8}$ in. by $3\frac{1}{4}$ in. These three ranges provide punching capacity of from 21 columns to 130 columns.

Specimen cards are given, Forms Nos. 71-73, from which it will be seen that the columns on the cards are divided into groups of one or more columns, each group representing an

Form No. 71.

INV. NO.	AREA	QUALITY	GRADE	WEIGHT	AMOUNT
10 30 60	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	10 30 60
1 1 1 1 1	1 1 1 1 1	1 1 1 1 1	1 1 1 1 1	1 1 1 1 1	1 1 1 1 1
2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2	2 2 2 2 2
3 3 3 3 3	3 3 3 3 3	3 3 3 3 3	3 3 3 3 3	3 3 3 3 3	3 3 3 3 3
4 4 4 4 4	4 4 4 4 4	4 4 4 4 4	4 4 4 4 4	4 4 4 4 4	4 4 4 4 4
5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5	5 5 5 5 5
6 6 6 6 6	6 6 6 6 6	6 6 6 6 6	6 6 6 6 6	6 6 6 6 6	6 6 6 6 6
7 7 7 7 7	7 7 7 7 7	7 7 7 7 7	7 7 7 7 7	7 7 7 7 7	7 7 7 7 7
8 8 8 8 8	8 8 8 8 8	8 8 8 8 8	8 8 8 8 8	8 8 8 8 8	8 8 8 8 8
9 9 9 9 9	9 9 9 9 9	9 9 9 9 9	9 9 9 9 9	9 9 9 9 9	9 9 9 9 9

ILLUSTRATION OF POWERS-ONE CARD WITH 21 COLUMNS

accounting fact. This grouping of columns can be varied according to the requirements of the particular user and the nature and extent of the information to be recorded.

If desired, cards can be used for the dual purpose of original document and punched record. In such cases provision is

made for writing on the card the information which is subsequently punched into it. Such dual-purpose cards are frequently used as Material Requisitions, Job Tickets, etc.

The initial operation of punching the cards and of verifying is the only manual operation in the system.

Form No. 72.

DRAWING NO										REF										DESCRIPTION										BIN NO										N.I. QTY LABOUR MATERIAL									
10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90																			
1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1																			
2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2																			
3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3																			
4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4																			
5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5																			
6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6																			
7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7																			
8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8																			
9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9																			
10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10																			

ILLUSTRATION OF POWERS-FOUR CARD WITH 36 COLUMNS

Two main types of machines are available for this work: hand punches in which the operator supplies the energy for perforating the card, and automatic punches with which the perforation is mechanically performed.

Form No. 73.

DRAWING NO										REF										DESCRIPTION										BIN NO										N.I. QTY LABOUR MATERIAL									
10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90										10 20 30 40 50 60 70 80 90																			
1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1										1 1 1 1 1 1 1 1 1 1																			
2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2										2 2 2 2 2 2 2 2 2 2																			
3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3										3 3 3 3 3 3 3 3 3 3																			
4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4										4 4 4 4 4 4 4 4 4 4																			
5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5										5 5 5 5 5 5 5 5 5 5																			
6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6										6 6 6 6 6 6 6 6 6 6																			
7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7										7 7 7 7 7 7 7 7 7 7																			
8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8										8 8 8 8 8 8 8 8 8 8																			
9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9										9 9 9 9 9 9 9 9 9 9																			
10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10										10 10 10 10 10 10 10 10 10 10																			

ILLUSTRATION OF POWERS-SAMAS CARD WITH 65 COLUMNS

Powers-Samas Hand Punches. The operation of this punch is extremely simple. A card is inserted in the carriage, which is then moved along to the first punching position. The appropriate keys being depressed, the carriage moves to the left as the card is punched—and the card is taken out by hand at the completion of the process. Although with this type of punch the depression of the key perforates the card, the touch

is extremely light and very high speeds of punching can be attained.

Automatic Key Punches. These punches, by reason of their automatic features, possess advantages which cannot be incorporated in the hand punches. The card is fed into position, punched, and ejected from the machine automatically,

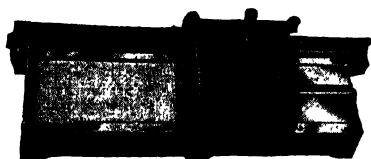


FIG. 18. POWERS-SAMAS MODEL "E" HAND PUNCH

thus enabling the maximum speed of output to be obtained. The depression of the keys does not perforate the cards, but "sets up" the individual punches for each column. Then on depression of the "Punch" key, the whole card is automatically punched and ejected. As no perforation is made in the

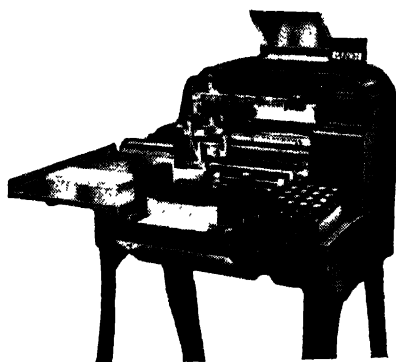


FIG. 19. POWERS-SAMAS UNIVERSAL AUTOMATIC KEY PUNCH

card until this final operation, there is the minimum of fatigue, and wastage due to spoiled cards is practically eliminated. Another special feature of the machines is the repeat-punching facility, which permits of extremely rapid automatic punching of quantities of similar cards—a valuable consideration when, say, card-per-unit stock control is contemplated.

Powers-Samas Hand Verifier. The correct punching of the cards, which is vital to the success of the system, is ensured

with the Powers Hand Verifier. This provides a check on the accuracy of the punching—double as well as single punching.

All types of error are discovered by this verifier—wrong positions punched, positions punched but not required and omissions to punch required positions.

The machine is similar to the Hand Punch in appearance and is as simple in operation. The operator places the punched card in the Hand Verifier and, reading from the original document, repeats the punching operation. Whenever the second operation differs in any way from the first, the card is locked in the machine, thus compelling the operator's attention

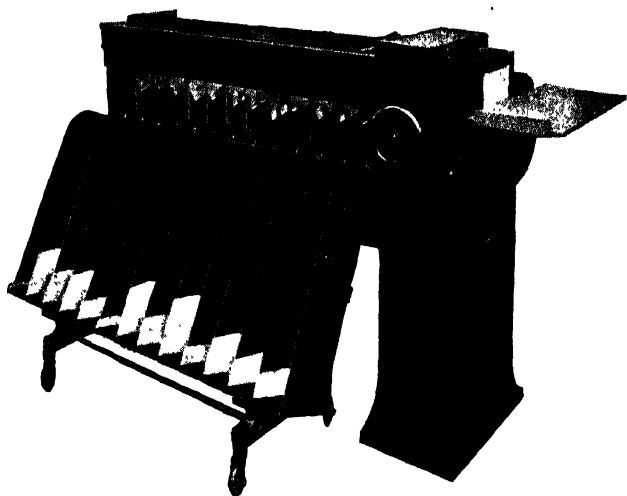


FIG. 20. POWERS-SAMAS AUTOMATIC SORTER

to the mistake. In addition, a distinguishing mark is made on all cards which are placed in the Hand Verifier, thereby visibly proving that the cards have undergone a verification process.

For mechanical verification the Automatic Verifier is recommended. This machine mechanically verifies the punched cards and inserts a specially coloured card wherever there is an incorrectly punched card.

Sorting. The mechanical classification of the punched cards is performed by the Automatic Sorter. The cards are placed in batches in the magazine and a pointer is set against the column on which the sorting operation is to take place. The machine is then set in motion and the sorting proceeds

automatically, the machine stopping as soon as a receiving box is full or when the supply of cards is exhausted.

Tabulating. The punched cards having been sorted into the required classified groups, it is then necessary to extract from them the information they contain. This final operation is performed by the Powers-Samas Printing Tabulator, which interprets the information punched in the cards and prints

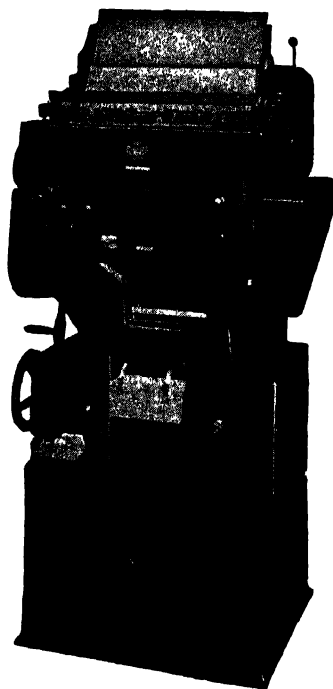


FIG. 21. POWERS-SAMAS ALPHA-NUMERICAL TABULATOR

it in statement form. Words as well as figures can be printed, the tabulator adding or subtracting and producing sub- and grand totals and balances whenever required.

The working of the Powers-Samas Tabulator is entirely automatic. By a system of mechanical contacts through the holes in the cards, the machine is enabled to list and add or subtract all or any part of the information appearing on the cards as they pass through the machine. Quantities or varying currencies, weights or units can be added or subtracted; the

tabulator automatically sensing the different groups of cards and taking off totals and balances at the predetermined point. Powers-Samas Tabulators are fully equipped for all the operations connected with general and cost accounting. Alphabetical printing is provided by the numeralpha unit of twenty-five

STATEMENT SHOWING EXPENDITURE TO 30th SEPTEMBER, 1949, AS COMPARED
WITH AMOUNTS PROVIDED IN ANNUAL ESTIMATES

AMOUNT PROVIDED IN ANNUAL ESTIMATES	EXPENDITURE ACCOUNT	EXPENDITURE CODE NO	ACTUAL EXPENDITURE TO 30th SEPTEMBER, 1949	FURTHER ESTIMATED EXPENDITURE TO 30th SEPTEMBER, 1949	TOTAL EXPENDITURE TO 30th SEPTEMBER, 1949
£			£ s d	£ s d	£ s d
	TOWN HALL	11100	+		+
9	LOAN CHARGE	11101	4 10 0+		4 10 0+
747	HALL KEEPER	11104	350 0 0+		350 0 0+
700	NIGHT WATCH	11105	400 0 0+		400 0 0+
135	INSURANCE	11111	135 0 0+		135 0 0+
1500	TELEPHONE	11119	408 0 0+	400 0 0	808 0 0+
35	UNIFORMS	11120	10 0 0+	10 0 0	20 0 0+
150	RENTS	11141	75 0 0+		75 0 0+
992	RATES	11142	496 0 0+		496 0 0+
2800	REPAIRS ETC	11143	1575 0 0+	208 0 0	1783 0 0+
700	WAR DAMAGE	11145	250 0 0+	82 0 0	332 0 0+
500	FURNITURE	11146	107 0 0+	153 0 0	260 0 0+
125	CLEANING	11147	62 0 0+		62 0 0+
1347	H I LT WATER	11148	392 0 0+	357 0 0	749 0 0+
70	SUNDRIES	11170	24 0 0+	15 0 0	39 0 0+
			+ 4288 10 0+	- 1225 0 0	+ +
	CANADIAN AVE	11300	+		+
2160	LOAN CHARGE	11301	1083 0 0+		1083 0 0+
450	NIGHT WATCH	11305	226 0 0+		226 0 0+
15	INSURANCE	11311	19 0 0+		19 0 0+
700	RENT	11341	100 0 0+		100 0 0+
650	RATES	11342	340 0 0+		340 0 0+
900	REPAIRS ETC	11343	402 0 0+	193 0 0	595 0 0+
400	FURNITURE	11346	172 0 0+	116 0 0	288 0 0+
1100	CLEANING	11347	608 0 0+		608 0 0+
1822	H I LT WATER	11348	407 0 0+	259 0 0	666 0 0+
50	SUNDRIES	11370	29 0 0+	22 0 0	51 0 0+
			+ 3386 0 0+	+ 590 0 0	+ +
	LOUISI MOUST	11700	+		+
5	INSURANCE	11711	5 0 0+		5 0 0+
50	REPAIRS ETC	11743	18 0 0+	11 0 0	29 0 0+
			+ 23 0 0+	+ 11 0 0	+ +

Form No. 74. A SPECIMEN TABULATION PRODUCED ON A POWERS-SAMAS ALPHABETICAL PRINTING TABULATOR

sectors capacity, which prints alphabetical and/or numerical characters according to the punching of the cards.

Auxiliary Machines. Various auxiliary machines are available for special purposes. These include—

(a) Reproducing Punch which automatically produces a new pack of cards containing all or part of the information punched in an existing pack.

(b) Summary Card Punch which, when attached to the Tabulator, automatically produces a summary or balance card simultaneously with the printing of a total by the Tabulator.

(c) Multiplying Punch which will sense amounts punched in a card, multiply them and punch the product into the same card.

(d) Cross-adding Punch which adds or subtracts up to four amounts punched in a card and punches the resultant total into the same card.

(e) Interpreter which will print on the face of the card the interpretation of the holes punched in it.

(f) Interpolator which automatically compares two packs of cards and groups, interleaves or divides them according to the agreement or disagreement of the designation punched into them.

This is of particular interest when the tabulator is being used for the preparation of a pay roll, or for invoicing or statements which require the customer's name and address to be printed as well as the description of the goods supplied.

These machines are now being used for such purposes as—
Pay Roll.

Labour and Material Costs.

Production Control and Work in Progress.

Plant Inventories, Transport Records.

Stores Accounting, General Accounting.

Etc., etc.

PREDETERMINED COSTING. (See STANDARD COSTING and BUDGETARY CONTROL.)

PREDETERMINING INDIRECT EXPENSES. (See ESTABLISHMENT EXPENSE.)

PRELIMINARY EXPENSES. The expense incurred in connection with the formation, etc., of a company is not included in the cost accounts, as this item relates entirely to a Profit and Loss Account transaction.

PREMIUM OR BONUS EARNINGS—RECORD OF. The premium or bonus earnings of employees are usually recorded in such a manner that any abnormal earnings on the part of individual workers in respect of the same operation can be notified to the Time Study or Progress Departments. The reporting of abnormal bonus earnings is important, as it is then possible for the departments concerned to investigate such items with a view to taking the necessary steps for the rectification of any errors that may have been made.

A specimen record card is given, Form No. 75. It will be seen that any alterations or modifications following an investigation are noted in the remarks column, so that the cards will contain a complete history of any changes made either in regard to the time allowed, rates, or method of manufacture. A separate card should be allocated to each article or to every single operation on such article, and filed either under the name of the article or component, name of operation, or symbol number.

The information posted to this record is obtained from the respective job cards or work tickets and the name of the operator, rate, quantity passed and rejected, and the rate of bonus entered in the appropriate columns, together with the time allowed and time taken.

The record of premium or bonus earnings as described above is arranged and indexed under the name of the article or operation and, in addition, or in place of this record, it may sometimes be desirable to prepare a record of the total amount of bonus earned by each worker from week to week. In such a case the record may take the form of cards or loose sheets, of which the illustration shown, Form No. 76, is an example. In this instance the records are indexed either under the name of the worker or clock number, and at the end of each pay week all the job cards relating to the one worker are collected and entered thereon. When such a record is used it provides the management with useful information in regard to the amount of the bonuses earned, also whether each worker is maintaining his rate of output, especially when engaged upon standard production.

For instance, the figures in the column headed " amounts earned " will immediately show the variations, if any, of bonus earnings, and when workers are performing standard operations any fluctuations in earnings can be investigated and suitable action taken where necessary.

With such a record, therefore, it is possible to gauge the efficiency of each worker in so far as it relates to his increased output or bonus earnings.

PRICE LISTS. (See CATALOGUES—COST OF.)

PRICING STORES REQUISITIONS—METHODS OF. The pricing of stores requisitions usually presents some difficulty in cases where the purchase price of materials fluctuates or where a number of separate consignments of an article are received at varying prices. The nature of the industry which is being carried on will to a great extent determine the basis

of material pricing, whereas the method of cost finding and the detailed system in use will usually determine at what point and by whom the prices are inserted on the requisition. For instance, with some concerns, stores requisitions are priced by the Cost Department from a record of prices kept by them, or the requisitions may be sent to the Purchasing Department, who price them from their records, whereas in other cases the stock record clerk may carry out this work.

From the above it will be seen that a consideration of this subject will fall into two categories: firstly, at what figure shall issues of materials be priced; and secondly, by whom shall the requisitions be priced?

The various methods of pricing material issues are as follows—

1. At actual purchase price.
2. At average purchase price.
3. At present market price at time of consumption.
4. At purchase price of highest price stock.

1. Actual Purchase Price. The pricing of materials consumed in production at their original purchase price is the best method to use whenever conditions will permit of its adoption. With this method it is necessary to keep a record of prices by "lots," so that when each issue is made it can be priced at the original figure, i.e. at the price of the oldest stock on hand. The method is best illustrated by the following statement—

RECEIPTS.			ISSUES FROM STOCK.		
Date.	Quantity.	Price.	Date.	Quantity.	Price.
July 29	500	2/6 each	July 30	250	2/6
" 31	1,000	2/3 each	Aug. 1	200	2/6
			" 3	300	50 at 2/6
			" 4	500	250 at 2/3
					2/3

It will be seen from the above that two prices are inserted on the stores requisitions whenever the balance on hand of the one lot is not sufficient, necessitating a quantity being drawn from the next lot to fill the requisition. This method of pricing by "lots" does not require that the stock be kept by "lots" also, as the record of prices can easily be noted on the stock record card.

The advantages of this method may be stated as follows—

(a) It provides the only means of ascertaining accurate material cost, as an estimated or average price is not used.

(b) It avoids the accumulation of obsolete stock, since materials are presumed to be used in the order purchased.

(c) A company is able to safeguard its profits when tendering and accepting a contract on the basis of current material prices by contracting for materials. Any rise or fall in prices would not then affect costs.

The original purchase price method is specially suitable for almost all kinds of stores items and particularly in those cases where prices fluctuate violently, but with such staple materials as scrap and pig iron for foundry work, etc., the difficulties of storage and handling, etc., may render the method unsuitable.

When this method is adopted it is good practice to record the purchase price of materials on the stock record card, which is usually kept by the Cost Department, and in advocating this it does not necessarily imply that the stock record card must show the values of stocks on hand as well as quantities. Provision can be made for noting the purchase prices of materials simply by allowing three or four columns on the left-hand side of the card, as shown on page 340.

With the above ruling of stock record card the "values" of stocks on hand are ascertained through a system of stores control accounts.

2. Average Purchase Price. This is a method that is sometimes used when pricing certain bulk materials such as pig iron, coke, sand, etc. A considerable amount of clerical work is involved with this method, as every change in the purchase price of each consignment received requires a recalculation of the average figure which is used for pricing stores requisitions.

Clerical errors are therefore frequently made with this method, unless an elaborate system of check is provided.

The average price of each item is calculated by adding the quantity and value of each consignment received to the balance of stock on hand, and dividing the total value by the total quantity, e.g.—

Assume an item of stock to be $\frac{5}{8}$ in. Hex brass rod, and on 1st June the balance on hand is—					
	3,400 lb. at 6d. lb.	.	.	£	s. d.
				85	- -
On 2nd June there is received					
	2,500 lb. at 8d. lb.	.	.	83	6 8
	= 5,900 lb.	.	.	£168	6 8
therefore					
	$\frac{£168 \cdot 6s. \ 8d.}{5,900}$				
					= 6.848d. per lb.

All issues of materials would now be priced at 6-848d. per lb. until the next consignment is received, when the price is again recalculated as follows—

			£	s.	d.
June 3rd.	Issues	4,425 lb. at 6-848d. per lb.	126	5	2
	Balance on hand,	1,475 lb. at 6-848d. per lb.	42	1	6
„ 5th.	Received	3,025 lb. at 9d. per lb.	113	8	9
	Balance on hand,	4,500 lb.	£155	10	3
	therefore	$\frac{£155 \text{ 10s. 3d.}}{4,500} = 8-294\text{d. per lb.}$			

In order to reduce the amount of clerical work entailed by this continual averaging of prices, it is sometimes the practice to calculate all prices at the end of the month and to use this figure throughout the ensuing period ; alternatively, to average the price for the month during which the issues were made, and to price the stores requisitions accordingly. With the latter method it is necessary to hold up all stores requisitions until the month end—a practice which cannot be recommended in many cases.

The use of the average method of pricing requisitions will generally lead to great differences when an attempt is made to reconcile the cost accounts with the total purchases and stocks on hand, etc., for any long period, and in those instances where the average material price is used for estimating purposes, there is always the danger that materials will be figured at a higher or lower rate than the actual purchase price.

3. Present Market Price at Time of Consumption. The pricing of stores requisitions at current market price is a method more usually adopted by concerns who purchase large supplies of raw materials well in advance of their requirements.

A “ Materials ” or “ Stock ” Adjustment Account for each class of material is used with this method, so that the difference between current market price and purchase price can be ascertained. The balance of the account is transferred to Profit and Loss Account at convenient periods.

Assuming that six months’ supply of pig iron is purchased for the foundry under contract at 6d. per lb., and that during this period the market price was—

1st month	.	.	.	6½d. lb.
2nd	„	.	.	6½d. „
3rd	„	.	.	7d. „
4th	„	.	.	6½d. „
5th	„	.	.	8d. „
6th	„	.	.	7½d. „

the pricing of all issues and adjustments would be dealt with in the following manner—

				£	s.	d.
Deliveries—1st month,	5,000 lb. at	6d. per lb.		125	—	—
2nd "	5,000 "	6d. "		125	—	—
3rd "	7,500 "	6d. "		187	10	—
4th "	5,000 "	6d. "		125	—	—
5th "	10,000 "	6d. "		250	—	—
6th "	2,500 "	6d. "		62	10	—
				<u>35,000</u>	<u>£875</u>	<u>— —</u>

				£	s.	d.
Issues—1st month,	4,000 lb. at	6½d. per lb.		104	3	4
2nd "	3,500 "	6½d. "		94	15	10
3rd "	9,000 "	7d. "		262	10	—
4th "	4,500 "	6½d. "		126	11	3
5th "	9,000 "	8d. "		300	—	—
6th "	3,500 "	7½d. "		109	7	6
				<u>33,500</u>	<u>£997</u>	<u>7 11</u>

The issues during the period are charged to the foundry (i.e. Cost of Melt Account) at market prices and a Pig Iron Adjustment Account credited. The Stores or Material Control Account is then credited at the actual purchase price, the corresponding debit going to the Pig Iron Adjustment Account.

JOURNAL ENTRIES

		Dr.			Cr.		
		£	s.	d.	£	s.	d.
<i>Cost of Melt Account.</i>							
(21)	Issues of Pig Iron—						
	(March) 4,000 lb. at 6½d.	104	3	4			
	(April) 3,500 " 6½d.	94	15	10			
	(May) 9,000 " 7d.	262	10	—			
	(June) 4,500 " 6½d.	126	11	3			
	(July) 9,000 " 8d.	300	—	—			
	(August) 3,500 " 7½d.	109	7	6			
	To Pig Iron Adjustment Account				997	7	11
	Journalizing value of Pig Iron issued at current market price at time of consumption.						
(22)	Pig Iron Adjustment Account	837	10	—			
	To Raw Material Stores Control A/c				837	10	—
	Being transfer of Pig Iron issued from stores during six months ending 31st Aug., 19..... at purchase price, i.e. 33,500 lb. at 6d. lb.						

JOURNAL ENTRIES—(contd.)

		Dr.	Cr.
		£ s. d.	£ s. d.
(23)	Pig Iron Adjustment Account .	159 17 11	
	To Profit and Loss Account .		159 17 11
	Transferring balance of former account to the latter account, being difference between the actual purchase price and current market price of pig iron consumed during six months ending 31st Aug, 19...		

Dr. COST OF MELT ACCOUNT Cr.

Dr.		J.E.	£	s.	d.					Cr.
19__	Pig Iron—									
Mar. 31	4,000 lb. at 6½d. .	21	104	3	4					
Apr. 30	3,500 " 6½d. .	21	94	15	10					
May 31	9,000 " 7d. .	21	262	10	—					
June 30	4,500 " 6½d. .	21	126	11	3					
July 31	9,000 " 8d. .	21	300	—	—					
Aug. 31	3,500 " 7½d. .	21	109	7	6					

(Note this account will also contain particulars of other metals used, etc., also labour, and may not be in the form of an ordinary Ledger account.)

Dr. PIG IRON ADJUSTMENT ACCOUNT Cr.

Dr.		J.E.	£	s.	d.					Cr.
19__						19__				
Aug. 1	To Pig Iron issued from stores at purchase price, i.e.—					Mar. 31	By Cost of Melt Act. Pig Iron issued at market price—			
	33,500 lb. at 6d. lb.	22	837	10	—		4,000 lb. at 6½d. .	21	104	3 4
31	To Transfer to Profit and Loss Account . .	23	159	17	11	Apr. 30	3,500 " 6½d. .	21	94	15 10
						May 31	9,000 " 7d. .	21	262	10 —
						June 30	4,500 " 6½d. .	21	126	11 3
						July 31	9,000 " 8d. .	21	300	— —
						Aug. 31	3,500 " 7½d. .	21	109	7 6
			£997	7	11				£997	7 11

RAW MATERIAL STORES CONTROL ACCOUNT

Dr.		J.E.	£	s.	d.					Cr.
19__						19__				
Mar. 31	To Purchases .		125	—	—	Aug. 31	By Issues .	22	837	10 —
Apr. 30	" " .		125	—	—		" Balance c/d., being balance on hand at this date .		37	10 —
May 31	" " .		187	10	—					
June 30	" " .		125	—	—					
July 31	" " .		250	—	—					
Aug. 31	" " .		62	10	—					
			£875	—	—				£875	— —
Aug. 31	To Balance b/d. .		£37	10	—					

(Note the debits and credits to this account will include the value of all purchases and issues of raw materials such as tin, copper, lead, etc., in addition to pig iron, etc., as the object of such account is to control the values of all raw material stock (see COST CONTROL ACCOUNTS). In the example given only the amounts are given which are represented by the issues of pig iron.)

4. At Purchase Price of Highest Priced Stock. The only advantage claimed for this method is that of precaution, as it is presumed that its adoption will safeguard a manufacturer against a decrease in the market price of materials. Reconciliation of costs with the total purchases and stocks on hand, etc., is only possible if a Materials Adjustment Account is used in a similar manner to that described for method No. 3, but the great amount of extra clerical work entailed will rarely justify the adoption of this method. When estimates are prepared, and the purchase price of the highest priced stock is used for figuring the material costs, business may be lost because tenders will be too high.

PRIESTMAN METHOD—WAGE INCENTIVE. Co-operative production, introduced by Messrs. Priestman Bros., Ltd., Holderness Foundry, Hull, is a method designed to bring about a better feeling in industry by creating confidence between the workers and the employers, and by rewarding the workers according to their increased energy and the exercise of their intelligence.

The system of co-operative production replaces individual work by team work and co-operative effort, and, as all contribute to the improvements that are made under it, all share in the benefits that accrue from it. It, therefore, includes all employees without exception—managers, clerks, and labourers, as well as those engaged more directly on production.

The principle of the method is very simple. If 100 men working 100 hours produce 10,000 articles, then if on another occasion these men produce 12,000 articles in a similar time, they have done 20 per cent more work, and hence receive 20 per cent more wages. Under this system everyone receives his increase on his salary or wages.

The standard of output which forms the basis of calculations under this method is arrived at by finding what has actually been done during a certain period. The output during any subsequent period is then compared with the standard, and if there is an increase the percentage is calculated and each employee receives a similar percentage of

increase on his wages or salary for that period. In general, the standard is obtained by taking the output over a normal period, the longer the better, allowances being made for abnormal conditions, such as short time, and averaging the output in relation to the hours worked.

In the majority of cases, however, this simple basis cannot be used: the "point" or "unit" method must then be applied. This consists in allotting values to the various products, after which the total production may be obtained by multiplying the value of each part of the product by the quantity produced and adding the results together. This method is exceedingly flexible, and no matter how much the different classes of product vary in quantity, the output figures bear a true relation to the standard when the correct values have been assigned.

When once a standard has been fixed, it should not be altered, except by mutual consent of the management and employees, but that it must be altered on occasions is obvious; for instance, if improved methods of production are introduced, such as the installation of labour-saving machinery, the standard must be altered accordingly.

It is important that the works committee or other representative of the employees should agree the standard of output, as confidence is essential to the success of this scheme. For this reason, the employees must be satisfied that the figures are correct, so that there can be no complaint afterwards of unfairness; furthermore, their representatives should have the right of inspecting the periodical figures of output on which the amount of bonus is payable, and also have access to the books so far as output is concerned.

The authors of this method claim that it is by this right of inspecting books and agreeing to the standards that confidence in the system is created.

It will be noted from the above that the Priestman system has nothing to do with wages rates, except to use them as a basis on which to pay bonus. (See also **WAGE INCENTIVE**.)

PRIME COST. Part of factory cost, and is the sum of direct materials, direct labour, and direct expenses.

PRINCIPLES OF ORGANIZATION. (See **ORGANIZATION—PRINCIPLES OF**.)

PROCESS COSTING. There are several methods of costing, viz., job costs, multiple costs, terminal costs, single costs, operating costs, process costs, etc., and the method best suited to any particular business is decided by the nature

of manufacturing activity and the lines of organization in operation. In considering which method is applicable to a certain trade or business, it is necessary to classify industries in accordance with their lines of organization and product. By so doing it becomes possible to indicate the methods which are specially applicable to any particular organization.

Costing by the process method is considered much simpler than most other methods, inasmuch as in the majority of instances it does not entail the same amount of routine and the variety of forms, etc., as are required in other methods. The process method is adaptable to any trade where uniform and continuous manufacture is carried on, and where one or more articles of a batch lose identity in the process of manufacturing and ultimately becomes part of a larger volume of production; or, in other words, form part of the actual finished article. This method is largely used in the chemical, paint, varnish, printing inks, canning, biscuit, mining, quarrying, and tanning industries, also in food products, gas and electricity undertakings; indeed, it is used to advantage in any trade whose business is concerned with the production of a definite article, be it liquid, solid or gas.

It is to be observed, however, that there are certain manufacturing businesses that owing to the special nature of their organization, although coming within the above, exempt themselves from this category. The character of their production constitutes the only basis of decision as to which method is best suited to them.

The principal function in process costing is to arrive at the cost of each variety of operation or process; a process cost account is kept for each process and it is debited with the cost of materials, labour employed, and also a proper percentage of expenses. Any credits arising from the sale of by-products or disposal of waste, etc., are credited to the process in which the credit occurs, and the balance shown represents the cost of the quantity produced.

Direct Materials—Treatment of in Process Costing. In a works manufacturing a standard article the general practice pursued is to work to a recognized formula or definite works order. The method of procedure is similar to that described concerning job costing. Such formula, or works order, serves as instructions to the various production departments throughout the factory. The works order should contain full particulars of the materials required, quantities, weights, etc., and a copy would be handed to the Cost Department.

[PRO]

DICTIONARY OF COSTING

[PRO]

Form No. 78.

TIME SHEET

Name..... Clock No.....

Trade.....

Week Ending.....19.....

	DEPT. 1.			DEPT. 2.			DEPT. 3.			DEPT. 4.			DAILY TOTAL.
	On.	Off.	Total.	On.	Off.	Total.	On.	Off.	Total.	On.	Off.	Total.	
M.													
T.													
W.													
Th.													
Fr.													
S.													

FOR WAGES DEPARTMENT USE.

Approved by.....
Foreman.

This copy acts as the basis for charging the various processes with the materials, and also gives the necessary details for finally ascertaining the cost.

Regarding the issue of materials from the stores, it is not always necessary or advisable with a system of process costing to issue these in small quantities by means of a stores requisition as is the case with job costing, as they may be delivered in bulk to the various manufacturing departments against the issue of a definite formula or production order. Exception would, however, be made in the case of bulky or weighty materials and where it might be inconvenient for a department to receive more than a given quantity at one time, owing to lack of space for storage.

As manufacturing proceeds in the various production shops, and the materials having been worked on are transferred from one department to another, the process accounts in the Cost Ledger will require to be written up, ruled off, and the balance "carried forward" and charged to the department receiving the article (or material) for the next operation or process, as will be observed in the accounts which follow. The routine of issuing the materials from stores against the production order, or formula, will provide the necessary data for crediting the Stores Control Account and charging the respective process accounts. In the case of materials found to be faulty, these would be returned to the stores, and the department or process concerned would receive credit in the usual way, i.e. through the medium of a rejection note.

Direct Labour—Treatment in Process Costing. So far as regards direct labour, this represents wages paid on direct manufacture, whether paid on piece work basis or by fixed weekly sums. It may happen that all the workpeople in each department are continuously engaged on one process, and the charging of direct labour to each process will present little or no difficulty, as the departmental pay sheet can be so ruled and arranged to give the desired information.

On the other hand, where the course of manufacturing necessitates two or more operations in the same department, or it may be where a workman is working in one department and then another, it is essential that daily or weekly time sheets be put into operation, so as to obtain the analysis desired. These time sheets are ruled to suit the requirements of the business, but the specimen given is sufficient to indicate what is required.

The starting and finishing time expended on any job or process are entered on this time sheet by the employee (or in

some works the method is to clock on and off), and the foreman of the department is responsible for checking and vouching these records. At the end of a given period, either daily or weekly, the time sheets are passed into the Wages Department, where they are checked and compared with the workers' gate cards, and the pay roll made out from the information and records so obtained. The necessary credit entry required for the Wages Control Account is taken from the totals of the pay roll, and the corresponding debit to the individual process accounts created.

Expenses—Treatment of in Process Costing. The principle involved in the collection and allocation of expenses is similar to that employed in materials and labour, viz., on the department basis. An expense allocation statement is worked out and prepared for a given period of either six or twelve months, and a division of the total made so as to produce a daily, weekly, or monthly figure, i.e. if the custom of the works is a weekly basis, one-fiftieth part of the yearly total of the expenses in each department would be charged to the Departmental Process Cost Account in total, or in detail if desired. Should there be more than one process carried out in any one department, a further division of the total departmental expenses would require to be made, and each definite process charged with its proper share of expenses, and these amounts journalized as a credit to the department's Expenses Control Account and debited to the various Process Cost Accounts in such department.

As the materials in course of manufacturing pass through the various stages of making into the finished article, they will increase in value, i.e. further material, labour, and expense will have been added to them. As an example, assume an article entering the Packing Department, the cost of the various packing materials used—may be wood boxes, paper, string, labels, etc.—also labour and expenses incurred in the Packing Department, will be added to the value of the article under consideration.

Upon the article reaching its final stage and being ready for sale, the various process costs are summarized and the final cost obtained.

Work-in-Process—Treatment of in Process Costing. With some industries there will always be a certain quantity of the product that will only be partly manufactured at the time the Process Cost Account is made up. This partly finished product is known as Work-in-Process and in the case of the cost account

being prepared, say, at the end of a month, the value of the carry over or work-in-process must be credited to the process. This valuation may take the form of a stocktaking and the unfinished work listed and priced at an estimated figure. On the other hand, where a system of process costing has been in use for some time there will be available the actual costs of the products in question, and in such cases an average actual cost will often be used.

The example of process costing described below does not present much difficulty in this regard, as the process of manufacture is not complicated, there being only one product made; each process is separate, and the items that constitute the cost of each of these processes can easily be ascertained and charged to the accounts. The work of valuing the inventory at the time the Process Accounts are made up will not, therefore, be difficult. As a matter of fact, the plant in which this particular method is used has a proper system for the control of production, and the production orders that are issued cover a quantity that can be completed within the accounting period. A carry over of unfinished work from one month to another is, therefore, eliminated.

The intimate relation between the work of cost accountancy and plant management is clearly shown in the above remark. Had proper co-ordination been ignored, the system of costing the output of the product would have been made more difficult by the fact that a stocktaking would be necessary before the Process Cost Accounts could be completed, and the costs rendered inaccurate by the introduction of an estimated figure for work-in-process.

Losses Due to Spoilt Work, etc. Spoilt work due to bad workmanship, faulty materials, etc., will arise in most industries, and the treatment of such losses in a system of process costing will depend upon the nature of the defective work. For instance, if the defective work is caused by faulty materials, the value of the material may be credited to the particular process and charged to a special account called "Faulty Materials." If the loss is due to bad workmanship, the value may be charged to the department or product at the time a further quantity of the materials is drawn from stock to replace those spoilt, the issue from stores being a debit to the department and a credit to stock.

The routine involved in connection with the recording of spoilt work, or the rejection of faulty manufactured goods, will not only vary with the class of trade that is being carried

on, but the volume of output, class of labour employed, and internal production methods will demand that each concern within an industry must have its special method. For further consideration of this subject please refer to "Defective Work—Cost of."

The object being to ascertain the cost of each process, it is necessary to consider the nature of the procedure in manufacture in order that some kind of classification can be given. Assume, therefore, an ordinary sized factory, comprising, say, ten departments, four of which are manufacturing or producing departments and the remaining six "expense" or "service" departments.

MANUFACTURING DEPARTMENTS—

1. Tinplate printing.
2. Tin box making.
3. "Liquid paste" making.
4. Card box making and packing.

SERVICE DEPARTMENTS—

- (a), (b), (c), (d), (e), and (f).

Further assume a factory making a "liquid," filled in tin boxes, packed in cartons of standard size, and sold in packages of grosses.

The procedure in manufacture may be said to be as follows—

1. Tinplate printing.
2. Tin box making.
3. "Liquid paste" making and filling tins.
4. Card box making, labelling, and packing.

Having received a works order for 622 gross of a certain "liquid" in tin boxes and packed in cardboard boxes complete, the operations or processes will be as follows.

Tinplate printing in the usual way constitutes two processes, viz., printing and/or varnishing and stoving. The sheets of tinplate pass through a printing machine, and each colour as printed entails a further operation or process, viz., stoving (being a technical term used for drying). The sheets upon leaving the printing machine are placed into racks and put in a hot air oven and dried. This is necessary before further colours are printed thereon. It will be gathered, therefore, that there are two processes, viz., printing and/or varnishing and stoving, and the process accounts would be worked out in accordance with the specimen Process Accounts Nos. 1 and 2.

The printed sheets of tinplates are next sent into the Tin Box Department, where the operation of stamping out and making the tins is performed. As will be observed from the Process Accounts Nos. 3 and 4, further materials are issued to the Tin Box Department, viz., tinplate required for stamping out the "bodies" of the tins (the "lids" only being printed). There are two processes effected in this

Form No. 80.

TINPLATE PRINTING DEPT.

PROCESS COST ACCOUNT

PROCESS No. 1.

*Printing
Lids.*

W.O.
No. 84

Dr.

Cr.

Date.						Date.						
19-- July 9	To Materials— 40 boxes of Tinplate at 45/- perbox " Inks and var nishes . . " Direct Labour and Super- vision . " Direct Charges " Direct Ex- penses . " Indirect Ex- penses .			£	s.	d.	19-- July 9	By Balance c/f. to A/c. No.2		£	s.	d.
				90	-	-				127	-	-
				2	-	-						
				20	-	-						
				10	-	-						
				3	-	-						
				2	-	-						
				£127	-	-				£127	-	-

Form No 81.

TINPLATE PRINTING DEPT.

PROCESS COST ACCOUNT

PROCESS No. 2.

*Stoving
Lids.*

W.O.
84

Dr.

Cr.

Date.					Date.						
19-- July 9	To Process No. 1 b/f . .			£	s.	d.	19-- July 9	By Balance c/f. to A/c No. 3	£	s.	d.
	" Direct Labour			127	-	-			142	-	-
	" Direct Ex- penses . .			10	-	-					
				5	-	-					
				£142	-	-			£142	-	-

department, viz., (1) stamping out, and (2) lipping and beading, and the accounts will appear as follows—

Form No. 82.

TIN BOX DEPT.

PROCESS COST ACCOUNT

PROCESS No. 3

*Stamping out
Lids & Bodies*

W.O.
84

<i>Dr.</i>				<i>Cr.</i>			
Date.				Date.			
19__ July 10	To Process No. 2 b/f.	£	s. d.	19__ July 10	By Product (A/c. No. 7)—Tin plate Cut- tings 30 cwts. at £3 per ton ¹	£	s. d.
	„ Direct Mate- rials— 44½ boxes Tinplate at 50/-	142	- -		„ Balance c/f. to A/c No. 4	4 10	-
	„ Direct Labour	111	5 -			260 15	-
	„ Direct Charges	4	- -				
	„ Direct Ex- penses . . .	3	- -				
		5	- -				
		£265	5 -			£265	5 -

¹ See By-products A/c, No. 7.

Form No. 83.

TIN BOX DEPT.

PROCESS COST ACCOUNT

PROCESS No. 4.

*Lipping &
Beading Lids
& Bodies.*

W.O.
84

<i>Dr.</i>				<i>Cr.</i>			
Date.				Date.			
19__ July 10	To Process No. 3 b/f.	£	s. d.	19__ July 10	By Balance c/f. to a/c. No. 5	£	s. d.
	„ Direct Labour	260	15 -			270	5 -
	„ Direct Charges	6	- -				
	„ Direct Ex- penses . . .	2	10 -				
		1	- -				
		£270	5 -			£270	5 -

It will now be realized that the tin boxes are complete and ready to be filled with "liquid paste" and packed. The empty tins are, therefore, delivered to the Paste Department, and the process performed in this department is: Making paste, filling and lidding tins, and the Process Cost Account will appear as follows.

Form No. 84.

LIQUID PASTE MAKING DEPT.

(FILLING AND LIDDING TINS)

PROCESS COST ACCOUNT

PROCESS No. 5.

*Making
Liquid
& Filling
Tins.*

W.O.
84

Dr.

Cr.

Date.		T.	C.	Q.	L.		Date.				
						£ s. d.				£ s. d.	
19-- July 11	To Process No. 4 b/t. . .					270 5 -	19-- July 11	By Balance c/f to A/c No. 6		325 5 -	
	" Materials . .					10 - -					
	" Direct Labour . .					25 10 -					
	" Direct Charges . .					14 10 -					
	" Direct Expenses . .					5 - -					
						<u>£325 5 -</u>				<u>£325 5 -</u>	

From this department the filled tins are sent to the Card-board Box Department, where they are packed in cartons, labelled and completed for dispatch, the Process Accounts (forms 85-87) showing as follows—

Form No. 85.

CARD BOX DEPT.

CARD BOX MAKING
LABELLING AND PACKING

PROCESS COST ACCOUNT

PROCESS No. 6.

*Card Box
Making,
Labelling &
Packng.*

W.O.
84

Dr.

Cr.

Date.		T.	C.	Q.	L.		Date.				
						£ s. d.				£ s. d.	
19-- July 11	To Process No. 5 b/t. . .					325 5 -	19-- July 11	By Product(A/c No. 7)			
	" Materials (Cardboard, etc.) . .					30 - -		Card Waste.		5 - -	
	" Direct Labour . .					24 10 -		" Balance, being fac- tory cost of product . .		392 5 -	
	" Direct Charges . .					7 10 -					
	" Direct Expenses . .					6 - -					
	" Indirect Expenses . .					4 - -					
						<u>£397 5 -</u>				<u>£397 5 -</u>	

BY-PRODUCTS ACCOUNT

Dr.

Cr.

Date.	Details.					Date.	Details.				
19-- July 10	By products from Process A/c No. 3, Tin- plate Cuttings			£	s.	d.					
11	„ products from Process A/c No. 6, Card- board Waste			4	10	—					
				5	—	—					
				£9	10	—					

Memorandum—

112 sheets = 1 box of tinplate.

40 boxes stamped out for LIDS, each sheet of which produces 20 lids.

∴ 40 boxes of tinplate = 622.22 GROSS LIDS.

44½ boxes stamped out for BODIES, each sheet of which produces 18 bodies.

∴ 44½ boxes of tinplate = 623.00 GROSS BODIES.

For accounting purposes, 622 gross of completed article.

There is no hard and fast rule in process costing so far as actual routine or the ruling of forms are concerned. The foregoing description, however, is sufficient to indicate the general principles of the process system of costing. (See BY-PRODUCT COSTING, also COST FINDING—METHODS OF.)

PRODUCTION EXPENSE. (See FACTORY EXPENSE.)

PRODUCTION ONCOST. (See FACTORY EXPENSE.)

PRODUCTION ORDER. Written instructions to the factory detailing work to be put in hand. (See also WORK TICKET.)

PRODUCTIVE DEPARTMENTS. (See MANUFACTURING DEPARTMENTS.)

PRODUCTIVE HOUR METHOD OF RECOVERING EXPENSES. (See DIRECT LABOUR HOUR METHOD OF RECOVERING EXPENSES.)

PRODUCTIVE WAGES. (See DIRECT LABOUR.)

PUNCHED CARD METHOD OF COSTING. All statistical work in costing and other business procedure consists of adding together the same original entries under different groups and sequences. These entries of facts and data are

WORKS ORDER No. 84. 9/7/19--
622 GROSS.....

PROCESS COST SUMMARY

DEPARTMENT.	Process.	Wages.		Process Materials.		Direct Charges.		Direct Expenses.		Indirect Expenses.		Total.	
		£	s.	d.	£	s.	d.	£	s.	£	s.	£	d.
PRINTING (Tin Plate) . .	No. 1	20	—	—	92	—	—	3	—	127	—	—	—
	No. 2	10	—	—	—	—	—	5	—	15	—	—	—
TIN BOX MAKING . . .	No. 3	4	—	—	111	5	—	5	—	123	5	—	—
	No. 4	6	—	—	—	—	—	1	—	9	10	—	—
LIQUID PASTE MAKING (Filling & Lidding Tins)	No. 5	25	10	—	10	—	—	5	—	55	—	—	—
CARD BOX MAKING (Labelling & Packing) .	No. 6	24	10	—	30	—	—	6	—	72	—	—	—
		90	—	—	243	5	—	25	—	401	15	—	—
Less : By-Product A/c —													
Process 3	4 10 —				9	10	—			9	10	—	—
Process 6	5 — —												
		90	—	—	233	15	—	25	—	392	5	—	—

PURCHASE REQUISITION

To be handed to Buying Dept. immediately. Date.....19.....

P. R. No. 1875.

Production or
Sales Order No.....

QUANTITY.

DESCRIPTION

REQUIRED FOR

Stock

Job

Specification

Part of
Order

Dept. Use

Date Required... .. Signed.....

From whom generally obtained.....

Order Dispatched....., 19... To.....

Purchase Order No..... Delivery Promised.....

Signed .

Buyer.

however, subjective things, which are normally represented by symbols; they are not material things which can be of themselves mechanically handled.

The Hollerith, Paramount, and Powers systems make use of a method of controlling the above operation by means of holes punched in a card, and a full description of each of the above systems will be found under their respective headings.

PURCHASE ORDERS. (See PURCHASING.)

PURCHASE REQUISITION. The "originator" of a purchase is equally important as the placing of the actual order, and only responsible officials should, therefore, be given the authority to instruct the buyer that a purchase is to be made. A form known as a "purchase requisition," and ruled similar to the specimen shown on page 358, is therefore brought into use to serve as the official notification that certain goods are required.

The authority to originate a purchase will be invested with different officials, according to the nature of the goods which have to be purchased. For instance, the storekeeper may be authorized to issue purchase requisitions for the replenishing of his stocks of general materials immediately he observes they have reached the minimum or re-order quantity, likewise the works manager, Planning Department, or drawing office may requisition any special materials required for a production order, whereas general stationery and sundry office supplies may be requisitioned by the secretary or departmental head, and factored or merchant goods by the Sales Department.

The specimen purchase requisition given contains spaces for inserting the production or sales order number for which the goods are required, or in the case of sundry expense items, the service order number. If, therefore, the requisition is issued by the Planning or other Works Department, the works order number will be quoted. On the other hand, requisitions issued by the Sales Department would have the sales order number inserted on them. The necessity for quoting such references will be apparent when it is remembered that the goods must be identified upon receipt.

When the storekeeper is given authority to issue purchase requisitions for general stores items, it is desirable that some form of check be provided, and this may conveniently be arranged by the storekeeper sending his requisition to the Cost Department, so that it can be compared with the stock record card. Furthermore, if a storekeeper is instructed to check the quantity of articles or materials in stock at the

time of making out his requisition, his bin card and the stock record card of the Cost Department can be reconciled and the purchase requisition then "O.K.'d" and passed on to the buyer.

PURCHASING. The purchasing routine will necessarily differ according to the trade and the amount of materials consumed in production, consequently there can be no standard method or system that can be applied to this branch of a business.

In small businesses, for instance, the purchasing of materials is generally carried out by the proprietor, his works manager or chief clerk. The ordering of materials would not be a big job and the routine involved would, therefore, be of a simple nature. An official order, however, is essential, and with the class of business now under review this may quite conveniently take the form of a duplicate order book.

Whereas this method may be all that is necessary to the small "one man" business, a large manufacturing concern will require a more elaborate system on account of the numerous items of materials that must be purchased. It therefore follows that the function of buying must be properly delegated and reduced to method, as only one department or individual should be authorized to do the actual purchasing.

With most manufacturing concerns the amount of work entailed in regard to buying is such that a separate department will be required. The chief of this department is usually known as the "buyer," or purchasing agent, and his duties may be to keep in touch with sources of supply, markets, be familiar with prices, specifications, quotations, and deal with the manufacturers and merchants in regard to placing of orders.

All requirements for goods would come through the channel of this department by means of what is known as a purchase requisition, made out by responsible officials of the staff. For instance, a works manager or departmental foreman might be authorized to requisition orders for raw materials; likewise a storekeeper for such indirect materials as tools, nuts, bolts, utensils, etc. Similarly, the draughtsman for drawing materials and the chief clerk for stationery, etc., the actual issuing and placing of orders, however, being carried out by the Purchasing Department. Whenever technical points arise concerning any goods requisitioned, the buyer would consult with the departmental chief.

Upon receipt of a purchase requisition the Purchasing Department will at once take the necessary steps to obtain

quotations if desired, or order the goods immediately. In the case of quotations being obtained the buyer must satisfy himself that the materials offered will comply with any special requirements, and be assured that the price is a fair one. The ordering of the goods having been sanctioned by the buyer, an order with the requisite number of copies is made out on an official form, which may be ruled similar to the illustration given on pages 362 and 363.

The loose-leaf principle of order book is advised and appeals to most firms inasmuch as it offers many advantages over the ordinary fixed-leaf books. There is no reason why orders should not be typed, thus making clear and distinctive records. They should be signed by the buyer or his authorized assistant, and the number of copies required will naturally depend upon the routine of each concern, but for the purpose of illustration four copies are here dealt with—

Original. This is dispatched to the supplier.

First Copy. Retained in Purchasing Department for checking invoices when received.

Second Copy. Handed to the storekeeper as a notification that the goods are on order. After making the necessary record, he passes it on to the goods receiving clerk, who retains same for the purpose of checking goods when received.

Third Copy. This is retained by the buyer for the purpose of following up the order, etc.

When it is desired that the second copy should not contain the prices at which the materials or goods have been purchased, the price columns are usually ruled for the purpose of recording some useful data for either the storekeeper or goods receiving clerk, and the prices omitted from these columns by the means of inserting a small piece of carbon paper.

With regard to the first copy, which is retained by the buyer, it will be observed that a space is provided for noting on the stock record cards in the Cost Department. This copy is, therefore, passed into the Cost Department where the necessary records are made concerning the purchase, and the price at which the materials are bought. This is necessary for the pricing of materials in connection with costs, etc. (See PRICING STORES REQUISITIONS—METHODS OF.) After completing these particulars, the copy of the purchase order is returned to the buyer.

It is a custom in most factories not to insert prices on the copies distributed, excepting that which is retained by the buyer, the prices being treated as confidential. In the author's

PUR]

DICTIONARY OF COSTING

[PUR

Form No. 89.

<p>Telephone Nos. PURCHASE</p> <p>Telegrams ORDER</p> <p>Codes used.....</p> <p style="text-align: center;">FROM</p> <p style="text-align: center;">THE PIONEER MANUFACTURING CO., LTD.,</p> <p style="text-align: center;">GLOBE WORKS,</p> <p style="text-align: center;">BRADFORD, YORKS.</p> <p>To—</p> <p style="margin-left: 40px;">MESSRS.</p> <p style="margin-left: 100px;">.....</p> <p style="margin-left: 100px;">.....</p> <p style="text-align: right; margin-right: 50px;">Date.19.....</p> <p>Please supply the following Goods in accordance with the Terms and Conditions stated on the back hereof, and deliver same to our Works, Carriage.per.....</p>	<p>No. 1865.....</p> <hr/> <p><i>It is essential that this Order No. be quoted on all Invoices, A dices, etc.</i></p> <hr/> <p>Reqn. No.364....</p> <p>W.O. No.733....</p>
---	--

Item No.	Quantity	Description.	Rate.	£	s.	d.
		<p>Signed.....</p> <p><i>(A useful size for Orders is 10 by 8 inches.)</i></p>				

PUR]

, DICTIONARY OF COSTING

[PUR

Form No 90.

Duplicate Copy		PURCHASE ORDER		No.... 1865		
				Reqn. No. 364 W.O. No. . 733		
Date..... 19 . .						
Recorded in Cost Dept.	Order Checked.	Order Completed.	Invoice Passed for Payment.	Remarks.		
Item No.	Quantity	Description.	Rate	£	s.	d.
		<i>(N.B.—On the back hereof suitable columns are printed for recording such particulars as are required. These details are inserted by the Purchasing Dept. on receipt of invoices, Inwards Goods Notes, etc., and cover Item No., I.G No., Invoice No., with Dates Received, Defective, Date Cleared, Remarks, etc.)</i>				

PUR]

DICTIONARY OF COSTING

[PUR

Form No. 89.

Telephone Nos. Telegrams Codes used.....	PURCHASE ORDER	No. 1865				
FROM THE PIONEER MANUFACTURING CO., LTD., GLOBE WORKS, BRADFORD, YORKS.		<i>It is essential that this Order No. be quoted on all Invoices, A dices, etc.</i>				
To— MESSRS.....		Reqn. No. 364 W.O. No. ... 733				
Date 19.....						
Please supply the following Goods in accordance with the Terms and Conditions stated on the back hereof, and deliver same to our Works, Carriage per.....						
Item No.	Quantity	Description.	Rate.	£	s.	d.
<div style="text-align: right; margin-right: 50px;"> Signed..... </div> <div style="text-align: right; margin-right: 50px;"> <i>(A useful size for Orders is 10 by 8 inches.)</i> </div>						

PUR]

DICTIONARY OF COSTING

[PUR

Form No 90.

Duplicate Copy		PURCHASE ORDER		No.. 1865		
				Reqn. No... 364		
				W.O. No. . 733 ..		
Date.....				19 . . .		
Recorded in Cost Dept.	Order Checked.	Order Completed.	Invoice Passed for Payment	Remarks.		
Item No.	Quantity	Description.	Rate.	£	s.	d.
		<i>(N.B.—On the back hereof suitable columns are printed for recording such particulars as are required. These details are inserted by the Purchasing Dept. on receipt of invoices, Inwards Goods Notes, etc., and cover Item No., I.G No., Invoice No., with Dates Received, Defective, Date Cleared, Remarks, etc.)</i>				

opinion the treating of prices as confidential is simply a carry-over from old-fashioned methods and is unnecessary in the modern business. However, ignoring the controversial question as to whether the storekeeper and others should be informed of the purchase price of materials, the space can be very profitably utilized for recording particulars required by the various departments concerned. In the specimen form illustrated, the Receiving Department copy could be specially ruled with columns to allow the receiving clerk to enter against each item the quantities received, weights, condition of goods, etc., and the initial of the individual counting or weighing, etc., this information often proving very useful.

Regarding the third copy, retained by the buyer for the purpose of following up and urging delivery, etc., on the reverse side will be ruled columns for the following information: (a) "Item No.," (b) "Urged," (c) "Date promised." Columns (b) and (c) are repeated across the sheet, and the last column on the right-hand side headed "delivered." This copy is filed under due date of delivery promised, and the clerk will take out of his file each day copies of those orders which are due for delivery, and if no advice is to hand from the supplier stating that the goods have been dispatched, he will take steps to urge delivery.

As already stated, a buyer will only purchase goods against a purchase requisition, and therefore before proceeding with a description of the routine involved, attention must be given to the information contained in the requisition.

A specimen purchase requisition is illustrated on page 358, from which it will be observed that a space is provided at the top right-hand corner for the production, works, or sales order number. If the requisition emanates from the planning or some other department in the works, the works order number for which the purchase is required must be stated, together with full particulars of the goods, etc.

This reference number, together with the serial number of the requisition, is inserted in the space provided on the order, and the requisition is filed under the works or sales order number in the buyer's office, being available for future reference. When goods are purchased for resale only, the purchase requisition will be issued from the Sales Department, who will quote the sales order number in place of the works or production order number. In such cases it may be necessary to provide the Sales Department with a copy of the purchase order.

By following this method of reference it will be seen that the goods are easily identified when they are received.

Upon the receipt of any goods into the factory it is essential that a proper record be made, otherwise there can be no reliable check against suppliers' invoices.

It is a common practice in some factories to record the receipt of goods in a duplicate book ruled somewhat as shown on page 366.

The duplicate page is torn out, either when filled or at the end of each day, and passed into the buyer's office. This system has its advantages in the smaller factory, where a few items daily might be received, but when a considerable number of deliveries are made each day, the delay that occurs in the writing up of the stock records and more particularly in notifying either the storekeeper or buyer of the receipt of goods, more than outweighs any advantages that the system may possess.

Another method is that of recording the receipt of each consignment of goods on separate slips or notes. This system has many advantages, and its extra cost in stationery is negligible compared with its efficiency.

The form illustrated, which may be known as a "goods received note" or "inwards goods note," gives an example. The number of copies required will depend upon how many departments are concerned with the receipt of goods, but for the purpose of explaining the principles of the method under review it is assumed that three are sufficient immediately to notify those concerned with the receipt of goods, instead of waiting a day or more, as in the case of the former method. It is important that the Receiving Department be instructed to sign for all goods as "unexamined," except in the case of small parcels which can be verified at sight, and when making out the "inward goods note" to state thereon the condition in which the case or package was received.

It is usual for an advice note to be sent by the supplier of the goods at least a day before the goods are received, and the fact that the goods have been dispatched will be noted in the buyer's office on their copy of the order, and the advice note passed on to the Receiving Department. This serves to warn the receiving clerk that the goods may be expected, and enables him to make any special arrangements that may be necessary for their storage, etc.

Upon receipt of the goods the receiving clerk will enter on the inwards goods note full details of each item, and for this

Form No. 91.

GOODS RECEIVED SHEET

No. 1357

. 19

From.	How Consigned.	No. of Cases.	Particulars.	Condition.	Remarks.	Signature of Receiving Clerk.

Form No. 92.

INWARDS GOODS NOTE. <i>(Copy for Purchasing Department)</i>		I. G. No.12578.....
Received from.	
CARRIER... ..	CARRIAGE	
QUANTITY.	DESCRIPTION.	WEIGHT.
	DATE—	
	(The first copy, which is ruled as this, is retained in the book.)	
Package Description:		
Purchase Order No.:		
Required for :		

Form No. 93.

INWARDS GOODS NOTE. (<i>Attach this copy to goods</i>)		
RECEIVED INTO STORES		I.G. No.12578.....
DATE.....	SIGNATURE.....	
INSPECTED AND PASSED.		
DATE ..	SIGNATURE	
QUANTITY.	DESCRIPTION.	WEIGHT.
Package Description :	INSPECTOR'S SIGNATURE.....	12578
Purchase Order No. :		
Required for :		

(Stores and Inspection Copy.)

purpose he will use the copy of the purchase order already in his possession. The quantity received must not be copied from this purchase order, but only inserted after an actual count or weighing of the materials. Particular care should be exercised in noting the condition of the goods and state of packing, etc., also the name of carrier or railway company, and whether consigned carriage paid or forward. The purchase order number will also be transferred from the copy of the order, together with the production or sales order for which the goods are required. The second and third copy of the inwards goods note is then torn out of the book, one copy being handed to the buyer and the other attached to the goods. The buyer on receipt of his copy will duly enter against the particular item in his records that the goods have been received, at the same time noting any remarks regarding their condition, etc. The quantity received and the quantity ordered should then be compared, also the method of transit. Should the buyer already be in possession of the supplier's invoice, this is not passed for payment until after receipt from the storekeeper of his advice that the goods are delivered into his stores. The importance of this will be seen later.

The next step is the removal of the goods into the stores, but before this is done provision has to be made for the inspection or test of the goods, in order to ascertain whether they comply with any specification previously notified to the buyer on the purchase requisition. With large concerns it is sometimes necessary that a permanent inspection staff be attached to the Receiving Department, and when this is found desirable the system required for the inspection of goods will not present much difficulty, because this function can be discharged at the same time as the receiving clerk is unpacking, counting or weighing, etc. However, with smaller firms it is usually found more convenient for the Inspection and Test Department in the works to undertake the inspection of those goods received which must comply with some special requirement, leaving the storekeeper to inspect most of the general stock items. The system used in connection with the inwards goods notes illustrated conforms with the latter, and with this method the receiving clerk will notify the Works Inspection Department whenever any goods are received which must be subjected to a special test.

After testing and inspecting the materials the inspector will initial the third copy of the inwards goods note in the

space provided, and the receiving clerk will then pass the goods over to the storekeeper, who, after signing for their receipt, places them into their correct position in the stores and enters the item on the bin card.

It will be noted that the third copy of the inwards goods note is perforated across the top portion, and that the inwards goods number is repeated on both portions. This top portion serves as a receipt from the storekeeper that he has duly received the goods into stock and is, therefore, sent to the buyer as a notification to him that the goods have also passed inspection.

Rejection of Faulty Goods. Sometimes an occasion will arise when part of the goods or materials are rejected, and in such cases the inspector will make out a rejection note for such items, stating the reason, and attach same to the copy of the inwards goods note, which is sent with the remainder of the goods to the storekeeper. This rejection note is then passed on to the buyer with the top portion of the inward goods note. It is stated above that the buyer will not pass the supplier's invoice for payment on receipt of his copy of the inwards goods note, but will wait until he receives the notification from the storekeeper that the goods have been received by him, and that they have passed inspection. The necessity for this procedure will now be apparent, as there will always exist the possibility that a part of a consignment may be rejected.

The buyer is only now in the position, therefore, to check the supplier's invoice and pass to the Accounting Department for payment. The buyer's copy of the inwards goods note, together with the storekeeper's receipt and rejection note, if any, is now handed to the Costing Department for recording on the stock record cards which are kept in that department.

PURCHASING AGENT. (See BUYER.)

PURCHASING DEPARTMENT—EXPENSES OF. The total expenses of the Buying or Purchasing Department will form part of the establishment expenses of a business, and treatment of this item in the cost accounts will depend upon the manner in which all expenses incidental to the purchasing and the handling of materials are dealt with. The general practice may be considered under two headings, i.e. (1) the total of the above expenses is segregated from those which relate solely to production and allocated to a Material Handling Expense Account, and the amount recovered in cost separately

as a percentage on the value of materials consumed in production; and (2) the total expense is not separated from the other items of establishment expense, but included with the factory and/or selling expense rate.

In those cases where a merchandising business as well as manufacturing is carried on, it will be necessary with either of the above methods to apportion the amount over the Factory and Selling Departments.

With regard to (1) the expense of storekeeping and material handling, etc., should be dealt with separately from those items which relate solely to purchasing, as the apportionment is effected on two different bases.

The expenses of the Purchasing Department are allocated to the Factory and Selling Departments either on the basis of the value of purchases made or arbitrarily apportioned, according to the extent it is estimated these two sections of the business benefit by the activities of this department.

In regard to storekeeping and material handling expenses, however, it is more equitable to allocate this item on the basis of the average value of stocks or merchandise held rather than the value of purchases made, on account of the fact that merchandise may be shipped direct to customers or re-dispatched the same date as received.

With regard to (2) the expense of the Purchasing Department is included amongst the establishment expense and allocated to the Factory Expense and Selling Expense Account on the basis of the value of purchases made, i.e. merchanted goods and materials, etc., or direct to factory expenses if no merchandising business is carried on.

For a detailed consideration as to the treatment of material handling expense, see under that heading.

RATE CARD. Cards used for recording the rates of pay of each worker. With many of the large concerns there will usually be an Employment Department, whose chief duty is to ensure that a regular supply of the right type of labour is always available, and in such cases it will usually retain the "employee's record card," which may also contain particulars relative to the rates of pay of each worker. In these circumstances the wages section of the Cost Department may require a separate record for the purpose of checking the wage rates, etc., when issuing or calculating the times on the gate cards, job cards or work tickets. Alternatively, in those cases where the checking of rates is carried out by some other department such as the Rate Fixing Department or

Form No. 94

RATE CARD

NAME..... CLOCK No.

DEPARTMENT..... TRADE..... RATE AT START.....

DATE . .					
NEW RATE .					
AUTHORIZED BY					
DATE . .					
NEW RATE .					
AUTHORIZED BY					
DATE . .					
NEW RATE .					
AUTHORIZED BY					

Planning Department, etc., the rate cards will be required by them in place of the Cost Department.

A specimen ruling of rate card is given, from which it will be noted that beyond the information contained at the head of the card, there will only be required columns to denote the commencing and subsequent rates of pay. It should be noted that when separate rate cards are in use, care must be taken to ensure that any change of rate is duly notified and entered thereon, and in those cases where the "employee's record card" forms the master card for such records, it is usually the practice that the rate cards be frequently checked with them; alternatively, the Employment Department may at frequent periods check the rates entered upon the gate or job cards. The actual method of check, however, will be governed by the type of organization and the number of time cards dealt with throughout a period.

RATE PER ARTICLE METHOD OF RECOVERING SELLING EXPENSES. (See SELLING AND DISTRIBUTION EXPENSE)

RATE SETTING. This is the process of determining a time or price allowance for the performance of an operation or cycle of operations.

Formerly, rates were set arbitrarily by the foreman or rate setter. Judgment, experience, previous records, similarity to other existing rates, and the current value of labour more or less affected the decision.

As industry expanded and became more complex, this process became more refined and exact in its requirements and application.

Various methods of payment were devised, but basically they fall into two classes—

Payment by time or the time rate.

Payment by production or piece rate.

To-day the accepted procedure of Rate Setting follows a logical sequence. Motion Study to determine the proper routine and job conditions. Job Evaluation to establish the job at its proper wage level with reference to other plant occupations; and, finally, Time Study to determine the proper time or price allowance for the operation. (See also TIME STUDY, MOTION STUDY, JOB EVALUATION, WAGE INCENTIVE.)

RATES. The amount of rates paid is included among the establishment expenses of a business.

The rates payable to local authorities are invariably assessed on "values," and the respective amounts are therefore capable

of direct allocation. In the case of rates levied upon property, the basis of allocation to the Factory, Selling, and Administrative Departments will be the space occupied, whereas the rates assessed on machinery, etc., are allocated direct to factory expense and apportioned over the respective departments on the basis of the total value of machinery in each department.

Rates are classified as a "constant" expense.

RAW MATERIAL CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS, also STORES—FINANCIAL CONTROL OF.)

RECEIPT AND INSPECTION. A term often used when referring to the particular phase of storekeeping relative to the receipt and inspection of materials or goods. The work of receiving and inspection entails the checking of the quantity and quality, etc., of goods, and the recording of these upon a goods received sheet or inwards goods note. The work of stowing and recording immediately follows that of receipt and inspection. (See STORES ROUTINE.)

RECORD OF BIN INSPECTION. (See BIN INSPECTION.)

RECORD OF MACHINERY. (See PLANT RECORDS.)

RECORD OF PLANT. (See PLANT RECORDS.)

RECOVERING SALES EXPENSE. (See SELLING AND DISTRIBUTION EXPENSE.)

RECOVERY OF EXPENSES. (See COMPUTATION AND RECOVERY OF EXPENSES.)

REDUCED OUTPUT—BASING EXPENSES ON. (See ESTABLISHMENT EXPENSE.)

REFERENCE RATE—WAGE INCENTIVE PLAN. This is a variation of the Halsey premium. Instead of a standard time, a reference rate is fixed for each operation, and is rather more generous than the average cost at time rate. The premium is one-half the difference between the wages cost and the reference rate.

The effect is the same as the Halsey premium with a generous standard time. (See also WAGE INCENTIVE.)

REJECTION NOTE. A note or certificate intimating that the materials or goods which are stated thereon have been rejected for a specified reason. A rejection note may refer to incoming materials (i.e. goods received) or to goods made in the factory. (See GOODS RECEIVED—REJECTION OF, also MANUFACTURED GOODS—REJECTION OF.)

REJECTION OF INCOMING GOODS. (See GOODS RECEIVED—REJECTION OF.)

REJECTION OF MANUFACTURED GOODS. (See MANUFACTURED GOODS—REJECTION OF.)

REMUNERATION OF LABOUR. (See WAGE INCENTIVE.)

RENT. The money paid for the use of land and buildings, etc., forms part of the establishment expenses of a business.

The actual amount paid is allocated to the Administrative, Selling, and Factory Expense Accounts on the basis of space occupied by the respective sections of the business.

In those cases where the factory expenses are analysed by departments, the amount of rent chargeable to each is apportioned on the basis of the space occupied.

Rent is classified as a "constant" expense.

RE-ORDER QUANTITY. A term used in conjunction with the operation of stocks upon a minimum-maximum basis, and indicates the point at which further stocks must be re-ordered. (See MINIMUM STOCK.)

REPAIRS AND MAINTENANCE. The cost of keeping in good order the various properties, tools, etc., of a business may be debited to a "Reserve for Depreciation" Account when the depreciation rates include an allowance for maintenance charges, otherwise the expense is a separate charge to the Factory Expense Accounts.

In large factories the cost of repairs and maintenance for each department is separately ascertained by means of a system of service orders. This departmental analysis of expenses is also necessary when certain methods of recovering expenses in costs are used, such as machine rates, departmental rates, etc.

Repairs and maintenance charges are of two kinds—

1. Repairs which occur daily, such as to small tools, miscellaneous equipment, belting, etc.

2. Repairs of an extraordinary character, the cost of which is more correctly distributed over a long period of time. This expense may include the replacement of certain parts or work done which exceeds a predetermined limit.

The method of costing the work done on repairs and maintenance will depend upon the size of the factory and the works routine. With small concerns repair expenses are usually allocated direct to a general Repairs and Maintenance Account, or the cost of the work done charged to a "standing" or "service" order. At the end of the costing period the costs of each service order are ascertained and debited to either the General Repairs and Maintenance Account or to each department, and by this means they are included in the factory expense.

With larger concerns the cost of repairs will be dealt with according to their nature, and all labour, materials, and other

A Plant Department or Repair Department will usually be maintained for this class of work, which will receive credit for the work done.

Repairs and maintenance charges are classified according to the type or kind of asset similarly to the following, and may again be further classified as "fixed" and "loose"—

Hydraulic.

Land.

“ “ “ Offices.

REQUISITIONS—PRICING OF. (See PRICING STORES REQUISITIONS—METHODS OF.)

RESPONSIBILITIES AND DUTIES OF STOREKEEPER.
(See STOREKEEPER—RESPONSIBILITIES AND DUTIES OF.)

RETURNS TO STORES. (See STORES CREDIT NOTE or REJECTION NOTE.)

REWARD FOR GOOD TIMEKEEPING. Any reward or bonus paid to the factory employees for good timekeeping is an expense from which the factory will benefit and is, therefore,

charged to and included in the factory expense rate. The amount of reward or bonus paid should be allocated to each department of the factory.

When rewards or bonuses are given to members of the office staff the amount is allocated to the administrative or selling expense

ROWAN PREMIUM—WAGE INCENTIVE PLAN. Under the Rowan method the worker's day rate is guaranteed. A standard time is fixed and, if a saving is effected by the worker, a percentage equal to the percentage of saving is added to the time taken, c.g.—

Standard time .	100 hours.
Time taken . . .	50 hours.
Percentage saving	50%
No. of hours paid.	$50 + 50\% \text{ of time taken, i.e. } 25$ hours, = 75 hours.

It is very important to consider carefully Mr. Rowan's definition of standard time, which follows—

"The standard time or time allowed is the average time which the average workman—neither the quickest nor the slowest—takes to do the job under ordinary time rate conditions, *when giving a fair rate of output for his time wages—no more and no less.*" (The italics are mine.—Author.) This time standard is as indefinite as under the Halsey premium, and in view of the controversy which is still raging over the question of what is a fair day's work for a fair day's pay, the importance of the italicized part of the above definition will be appreciated. (See also WAGE INCENTIVE.)

ROYALTIES. The amount paid by way of royalties may be dealt with either as a direct charge or included amongst the establishment expenses.

The actual basis of allocation and its treatment in the cost accounts, however, may depend upon the size of the business and the nature and amount of the royalties paid. If the royalty is a definite amount per article, it may be treated as a direct charge in costs, but in those cases where the royalty payable is calculated upon goods sold, the necessary adjustments will require to be made at stocktaking periods if the stocks are priced at factory cost.

Alternatively, the amount may be dealt with as a direct charge to the Cost of Sales Account, or the total royalties paid over a period included in the establishment expenses and allocated to the Administrative Expense Account.

In the majority of cases it is preferable to deal with this

item by regarding it as a direct charge to the Cost of Sales Account, as by such means the amount of royalty is shown separately in the cost accounts, and not merged with the incidental expenses of manufacturing and selling which is the case if either of the other methods are chosen.

SALES EXPENSES. (See SELLING AND DISTRIBUTION EXPENSE.)

SALES EXPENSES—CONTROL OF. (See COST CONTROL ACCOUNTS.)

SALES MANAGER—SALARY OF. The salary paid to a sales manager is one of the items which comprise the establishment expense of a business. When the selling and distribution expenses are recovered separately in costs, the amount is allocated accordingly.

SECRETARY—SALARY OF. The amount of salary paid to the secretary is included among establishment expenses of the business. The allocation of the item will depend upon the duties performed by this official, as in many instances work which is not purely secretarial in nature will often be carried out by him.

With small concerns a secretary may be responsible for the general management of all office departments as well as attend to all correspondence and other sundry matters, in addition to the work of his own and the Accounting Department, but as the size of such a concern may not warrant the subdivision of expenses under the headings of factory, selling, and administrative, the allocation of the item will not present any difficulty, as all expenses will be grouped and recovered in costs as one total. In some instances, however, a secretary may perform all or some of the above duties in fairly large concerns, and in such cases the salary is apportioned over the respective sections of the business, according to the amount of time given to the respective functions.

With the very large concern the duties of the secretary will usually be confined to work of an entirely secretarial nature, and the amount of salary may then be allocated to the administrative expense or apportioned over the Factory, Selling, and Administrative Departments. The former method, however, is preferable.

SELLING AND DISTRIBUTION EXPENSE. Subdivision of establishment expense and comprising all the expenditure incurred in the sale and distribution of a firm's products, but excluding those items which enter into the cost of manufacture.

Selling expenses embrace such items as the salaries of the

sales manager and selling staffs and branch offices, discounts allowed, cost of advertising and catalogues, commissions to agents, travelling expenses of sales staff, etc., stationery, and also a proportion of lighting, heating, depreciation of buildings, etc., and share of the expenses incurred in the general and financial administration of the business when these are recovered separately in costs.

Examples of expenses that can be allocated direct are—

Salaries of sales manager, publicity manager, and Sales Department staff, travellers, etc.

Advertising and literature, catalogues, blocks and electros, circular letters, pamphlets, etc.

Commissions to salesmen and travellers, etc.

Discounts Allowed. **Carriage Outwards.**

Branch or District Office Expenses. Rent and rates, lighting, cleaning and caretaker's wages, local travelling expenses, commissions to district salesmen and travellers, postages, telephones and telegrams, salaries of typists, clerks, engineers, and inspectors, etc.

Examples of expenses that are usually "allocated" by apportionment—

Lighting and heating of head office, if forming part of general office and works buildings.

Repairs and maintenance of buildings, if forming part of general office and works buildings.

Expenses of the general and financial administration of the business.

Postages, telephones, transport expenses, etc., if not separately recorded.

With some industries the cost of packing and cases, etc., will be charged to selling expenses, and for a detailed consideration of such items, also those enumerated above, see under their respective headings.

Selling expenses are dealt with in costs, upon similar principles to those employed for works expenses, but the actual method used for recovering the expenses upon individual products, orders or processes will differ according to the nature of the industry. A great divergence of opinion exists as to what is the correct method of dealing with selling expenses in costs. It is contended on the one hand that selling expenses are incurred on orders *secured* and not on orders filled or completed by the factory. The correct treatment in such cases, therefore, requires that expenses be recovered by apportionment over the value of orders secured,

and not expressed as an amount on the value of goods dispatched.

From the point of view of theory, this argument may be correct so far as it concerns any business that sells and delivers goods *ex stock* and at a fixed price, but considerable difficulty will immediately arise when an order is modified and necessitates an adjustment of the sale price. If an order were cancelled or the quantity reduced, the whole or a portion of the expense on the particular order would require to be written back, and the effect of such adjustments would render the cost accounts useless, as any possibility of comparison would be completely eliminated. To avoid this perpetual adjustment, and the carrying forward of expenses that have been allocated to an order secured but not yet delivered, the expenses of selling and distribution are best dealt with by recovering them by one of the following methods—

(a) As a rate per article dispatched and invoiced to customers.

(b) As a percentage on the works cost of goods dispatched to customers.

(c) As a percentage on the sales value of goods dispatched to customers.

(a) **Rate per Article.** The choice of any one of the above methods will naturally depend upon the nature of the industry which is carried on. For instance, if the business is engaged in making only one article, the selling expense can be dealt with easily by dividing the estimated total for the period by the number of articles sold and so arrive at a rate per article. This method could also be used with advantage when one or a few articles of the same kind are made in a range of sizes, as relative unit values can quite easily be fixed for each size. In those cases where this method can be used it will give more accurate results than (b), as the correctness of the figure used will only depend upon two estimates, viz., the estimate of the selling expenses, and the estimated number of articles that will be sold for the period.

(b) **Percentage on Works Cost.** Most firms will be engaged in the manufacture of several articles of varying sizes which have no relative values, and in such cases selling expenses may then be dealt with by either (b) or (c) above. The formula for ascertaining the percentage rate on works cost is as follows—

$$\frac{\text{Estimated selling expenses for period} \times 100}{\text{Estimated works cost of goods sold for period}}$$

With this method the element of chance is introduced to a greater extent than with either (a) or (c), as it will be seen that its accuracy depends upon correctly estimating not only what the selling expenses should be for the period and the quantity of goods to be sold, but the works cost of such goods. The method, however, is specially suitable for businesses engaged upon non-standard work, such as a repair shop, certain kinds of foundries, general engineers, cabinet making, and the like.

(c) **Percentage on Sales Value.** The method of recovering selling expense as a percentage on the sales or invoice value of goods sold will give very accurate results if used in those cases where a firm's products are standard, and sold more or less at fixed prices or at fixed discounts. The formula for ascertaining the rate at which expenses will be recovered under this method is—

$$\frac{\text{Estimated selling expense for period} \times 100}{\text{Estimated value of sales for period}}$$

The basing of rates upon the estimated normal maximum output or sales and using a standard rate for the period is preferable to the method of adjusting the rate from month to month to meet fluctuating demands, as all statistics in regard to expenses are then based upon standard performances. Any difference between the standard and the actual amount of selling expenses recovered in costs will indicate the loss to the business through insufficiency of orders. (See also ESTABLISHMENT EXPENSE.)

SELLING EXPENSE CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

SERVICE DEPARTMENTS. The term "Service" (or "Expense") Department implies that the function of such department is to render service to all, or any, of the manufacturing departments. The exact size and specific functions of these auxiliary departments will vary in different industries. Frequently it may be decided to amalgamate two or even more functions into one department. A reasonably sized factory engaged in engineering may have Expense or Service Departments similar to the following—

1. Planning Department.
2. Progress Department.
3. Drawing Office.
4. Millwrights' Department.
5. Plant—Engineers' Department.

6. Welfare Department.
7. Tool Room.
8. Power Department.
9. Inspection or Viewing Department.
10. Receiving Department
11. Stores Department.
12. Estimating Department.
13. Cost and Wages Departments.
14. Rate Fixing Department.
15. Employment Department.

A brief outline of the functions performed by some of these departments will be found helpful.

Costing and Wages Department. The main functions of this department are quite apparent. The cost accountant is responsible for the operation of the entire cost system, in such a manner that every expense of the business is properly and automatically recorded on time cards, material sheets, job or cost cards, etc. His duties are wide and he is called upon for various figures covering every step in the process of manufacture, sale, and distribution of the company's products.

Planning Department. This department is concerned with the technical side of production throughout the factory. The course of procedure in the various processes of production is arranged and determined by this department. The issuing of works orders (in conjunction with the works manager) and planning of work throughout the factory, may sometimes form part of the numerous duties performed by the Planning Department.

Estimating Department. The main functions of this department are quite apparent, and with most concerns it forms a section of the Costing Department.

SERVICE ORDERS. The principles involved in the accounting and control of indirect expenses may be considered under two broad headings ; firstly, the accounting and control of expenses in total by means of a system of expense control accounts, and secondly, the accounting of such expenses in detail.

A system of expense control accounts will only control the expenses in total, and whilst this is necessary the control accounts alone are of limited managerial use, as they do not show in sufficient detail why or how the money has been spent. A system of service orders is therefore brought into use, so that the amount spent on each " service " or class of " indirect " work can be ascertained.

The problem of accounting for direct labour and direct materials does not present the same difficulty as the accounting for indirect materials, indirect labour, and indirect expenses. With the former it is possible to measure easily the quantity consumed in production and to deal with each item at the time it is used or paid for. With the latter, however, most of the facilities will be used before the amount of expense so incurred will be known and appear in the accounts as a liability. Such items are, therefore, dealt with on the basis of estimates, and at frequent periods the amount of expenses which will be recovered in costs is compared with those actually incurred.

A system of service orders will, therefore, play a very important part in any method of costing, as through them the cost of each class of service or indirect work is ascertained. Before the system of service orders can be brought into use the indirect expenses of a business must be properly classified, and in this direction it is not unusual for the items to be divided into two main groups, viz.—

1. Capital expenditure.
2. Revenue expenditure.

The service orders relating to capital expenditure will only include the cost of making and the installation of new plant, machinery, buildings, and equipment, etc., whereas the orders relating to revenue may comprise the expenditure on repairs, maintenance and upkeep, rearrangement and alterations, etc., and on all service departments, such as transport, supervision, storekeeping and material handling, inspection and viewing, general labouring, cleaning and sweeping shops, rectifying defective goods, attending to complaints of customers, experimental work, etc.

The division of the expense accounts into the two groups already mentioned clearly indicates the nature of the two forms of expenditure usually incurred by all manufacturing concerns. In the case of capital expenditure the total, other than small sundry amounts, will be transferred to the asset accounts in the financial books, whereas the total of the second group is a charge to Revenue Account.

The subdivision or sub-analysis of the two groups of expenses for the purpose now under review will usually follow somewhat on the lines already indicated, viz., firstly, in accordance with the nature of the expense, and secondly, the cause. In other words, the first step in the process of analysis

is to summarize the expenses under the headings of repairs, maintenance and upkeep, rearrangement and alterations, supervision, general labouring, inspection and viewing, etc., and the next process is to sub-analyse each of these items in order that the amount incurred by each department is separately ascertained. In the case of repairs, maintenance and upkeep such analysis will, firstly, relate to the kind of asset, i.e. whether plant, machinery, buildings, tools or equipment, etc., and secondly, each of these divisions will be further analysed to show the amount of the expense incurred by each department. For instance, the analysis of the repairs, maintenance and upkeep expense of the plant may be sub-analysed as follows—

REPAIRS, MAINTENANCE, AND UPKEEP—PLANT

	Symbol.
Steam raising	A1-1
Steam distribution	A1-2
Electricity generation	A2-1
Electricity distribution	A2-2
Electricity transmission	A2-3
Compressed air	A3-1
Hydraulic	A4-1
Heating	A5-1
Gas	A6-1

The sub-analysis of each item will naturally depend upon the size of the factory and the nature of the plant used and in those cases where a company generates its own electricity, the cost of repairs and maintenance of the generating plant will naturally be a charge to the cost of electrical power. On the other hand, if the electrical energy is purchased, the maintenance charges may only comprise the cost of upkeep, etc., of motors and power transmission system, and in such a case the expense may be sub-analysed on a departmental basis.

With regard to the repairs and maintenance of machinery, this item will generally be analysed either according to the type of machines in use or by departments. By classifying each Expense Account in the manner indicated, it is not only possible to ascertain the total amount expended upon each expense item over a given period, but the total amounts are analysed to show the proportion of the expense incurred by the respective departments; in other words, the cause of the expense is ascertained.

The allocation of serial numbers to the respective service

orders requires careful consideration, as the method of numbering must be sufficiently elastic as to allow of new service orders being added as the occasion demands, and without disturbing the sequence of each group or subdivision.

To facilitate this work it is desirable that symbols or letters be allocated to each group of expenses; for instance, the letter "A" may be allocated to all service orders relating to new plant, and "M" to repairs and maintenance; the letter "R" to the rearrangement and alterations of plant, etc., and "G" to cover all items of general shop expense, etc.

By such means the *class* of work that is being performed is denoted by the symbol letter, and the serial order number the sub-classification.

There is, however, a variety of methods of allocating symbols and numbers to service orders, two of which are illustrated below in connection with the detailed consideration of the more general items which are usually included among service orders. For a general discussion of symbols see also CLASSIFICATION OF ACCOUNTS.

Service orders relating to capital additions are usually dealt with in such a manner that the cost of the work done on each piece of new machinery can be separately ascertained.

The collection of the individual cost can be effected by the issue of a separate order for each job, and allocating a separate serial number to each order. For instance, if the serial order number, "S.O. 40," is allocated to machine tools, the first order issued for any work to be done can be numbered "S.O. 40/1." The number 40 indicates the nature and account classification of the work to be performed and the stroke 1 the separate account to which the cost is to be charged. The times of the men engaged upon the work, also all the materials issued from stores, will therefore be charged to this account number. When the next piece of machinery is made or delivered and ready for installation, the service order number issued will therefore be "S.O. 40/2," and the work entailed in connection therewith charged to the sub-account No. 2.

The ascertainment of the cost of any work done on each piece of new machinery is important, as without this analysis it is not possible to maintain a correct record of all assets. Similarly to the above, the work in connection with the repair maintenance, and upkeep of plant, machinery, and buildings should be analysed to show the expenditure incurred on behalf of the machine or group of machines and each building, etc.

Many other items of expense will require similar treatment ; for instance, the total amount of "idle " or " unallocated time," when collected by means of service orders, will require to be analysed in order to show the cause. This analysis may be effected by allocating a separate service order number to each subdivision ; alternatively, one service order number is given to " unallocated time " and the subdivision, obtained by means of stroke numbers or symbols, as follows—

UNALLOCATED TIME

Alternate Methods of Numbering.

Machine breakdown . . .	S.O. 406/1	G1-6A.
Waiting for tools . . .	406/2	G1-6B.
Waiting for materials . . .	406/3	G1-6C.
Belt breakdown . . .	406/4	G1-6D.
No work . . .	406/5	G1-6E.
Etc.		

The letter *G* indicates the main classification, i.e. general shop expenses ; the figure 1, the nature of the expense item, i.e. indirect labour ; and the figure -6, the subdivision of the main expense item, i.e. unallocated time ; and the letters *A*, *B*, *C*, etc., the cause.

When a list of service orders are issued to the factory departments, they should always be accompanied by full instructions as to their use and the nature of the items to be charged against the respective numbers, as some orders will have booked to them both labour and materials, whereas others will only comprise labour.

On the other hand, certain work, such as the cleaning and sweeping of shops, oiling and cleaning down the machine tools, supervision, etc., will be performed as and when necessary and as part of the daily routine, whilst other work, as, for instance, special repairs to plant and machinery, rearrangement and alterations, etc., will only be carried out to special instructions, and at less frequent periods. With the former class of work an official works order or instruction sheet is not required for the individual jobs, since the various workers will be more or less permanently allocated to the respective tasks. With the latter, however, special orders are necessary.

An example of the instructions usually attached to the list of service orders is given on page 387.

The extent to which all expense accounts should be classified into groups will depend upon the nature and size of the business, and no attempt will be made to give a list of service orders that will be suitable for any or every factory. In the circumstances a detailed consideration of the more general items which may be included amongst service orders will serve a more useful purpose.

STANDING INSTRUCTIONS—Service Orders

The attached list of service order numbers will come into operation on....., all previous lists being cancelled.

The attached is based on an entirely different principle from all previous lists, and it is therefore necessary that the following instructions be thoroughly understood and adhered to by all concerned; particular attention is drawn to the detailed description which is shown against each service order with a view to assisting you in quoting the correct order number to all work carried out under the above heading. Should, however, any doubt exist as to the correct service order number to be used, kindly take the matter up with the cost accountant, who will give any further explanation necessary.

WORK DONE ON A SERVICE ORDER THE ESTIMATED COST OF WHICH WILL NOT EXCEED £5 (FIVE POUNDS) IN VALUE

Materials for this purpose will not require an official works instruction sheet, but can simply be drawn from stock on a blue stores requisition. The exact purpose for which the material is required for the department where it is going to be used MUST be stated.

All stores requisitions must be signed by a foreman in reference to works matters, or otherwise by a departmental head.

Labour will be booked to the same service order number on which the above material is drawn.

WORK DONE ON A SERVICE ORDER NO. THE ESTIMATED COST OF WHICH WILL EXCEED £5 (FIVE POUNDS) IN VALUE

An official works instruction sheet must first be obtained from the Planning Department, and on this will be quoted a service order number.

Applications for works instruction sheets must be made out by—

- | | |
|---|--|
| 1. For work to be done for any <i>Works</i> Department. | } The foreman of the department concerned. |
| 2. For work required to be done for commercial departments. | |
| | } By the departmental head. |

The special duplicate books are provided for this purpose, and full description of the work must be stated. These applications will then be sent to—

(See above.) 1. The works manager, who will initial same as authority for the work to be put in hand.

(See above.) 2. The commercial manager, who will initial same as authority for the work to be put in hand.

Applications will then be passed on to the Planning Department for issue of works instruction sheet as mentioned above.

Materials required for carrying out the work mentioned must be drawn from stores on a coloured stores requisition (blue), *quoting the Order No. and signed by the foreman.*

Labour must also be booked to the same service order number on which materials are drawn.

CAPITAL EXPENDITURE (Additions)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 10	<p>POWER PLANT. (A distinction is usually desirable between plant and machinery to facilitate the collection of the various expense items as between the respective departments. The Service Orders relating to plant will therefore include all motive power plant such as electric motors, gas and steam engines, heating plant, gas producing plant, and the like, and the term "Machinery" will include producing machinery only.) The subdivision of the Service Orders relating to plant assets will usually depend upon the extent of the equipment, as one concern may only require a number of electric motors whereas others may generate their own electrical energy as well as gas and compressed air, etc.</p> <p>With the small concern the Service Orders may suitably be analysed as follows—</p> <p style="padding-left: 40px;">With those concerns who generate their own power the main subdivision of the Service Orders relating to plant may take the following form, and each main division being again subdivided according to the size and requirements of the business—</p>	
	<p>MOTIVE POWER PLANT to include all electric motors, gas engines, steam engines, etc.</p> <p style="padding-left: 40px;">STEAM RAISING PLANT, which will include boilers, stokers, economizers, water softening plant, etc. This plant item may be further analysed as follows—</p> <p style="padding-left: 80px;">Boilers (A1-1a), Stokers (A1-1b), Economizers (A1-1c), Water Softening Plant (A1-1d), etc.</p> <p style="padding-left: 40px;">STEAM DISTRIBUTION PLANT, to include all piping, valves, etc.</p> <p style="padding-left: 40px;">ELECTRICITY GENERATING PLANT, comprising steam turbines or engines, generators, switchgear, etc.</p> <p style="padding-left: 40px;">ELECTRICITY DISTRIBUTION PLANT to include transformers, cables, switches, etc. For further subdivision see Service Orders AS-1 and AS-2</p> <p style="padding-left: 40px;">COMPRESSED AIR PLANT</p> <p style="padding-left: 40px;">GAS PRODUCING PLANT</p>	<p>A1-1</p> <p>A1-2</p> <p>A2-1</p> <p>A2-2</p> <p>A3-1</p> <p>A4-1</p>

CAPITAL EXPENDITURE (Additions)—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.	
S.O. 11	<p>TRANSMISSION PLANT.</p> <p>When a separate Service Order is allocated to the transmission system the one account may be sufficient for most purposes, and in this instance will include main shafting, switches, cables, etc. (Countershafting may also be included here, but it is usually found more desirable to allocate this item to "Machinery.")</p> <p>With all but very small factories the Service Orders relating to transmission plant should be departmentalized whenever possible, and the department's symbol or letter quoted against the Service Order number. If, therefore, work is being done in, say, E. Dept. the Service Order number would be given as S.O. 11 E.</p>	<p>With large concerns the transmission plant may firstly require to be subdivided as to class, and secondly by departments. The subdivision into the various forms of transmission may be as follows—</p> <p>ELECTRICAL TRANSMISSION (Power). Which will include cables, switches, etc., of the power supply only.</p> <p>ELECTRICAL TRANSMISSION (LIGHTING). To include cables, switches, fittings, wiring, arc lamps, rosettes, guards, extension cords, etc.</p> <p>MECHANICAL TRANSMISSION (Power). Comprising line shafting, pulleys, spur gearing, chain drives, etc. Countershafting, belts, and ropes should not be included here, as it will be found more useful to regard countershafting as part of the equipment of the respective machine tools.</p>	<p>A5-1</p> <p>A5-2</p> <p>A5-3</p>
S.O. 12	<p>CONVEYORS, CRANES, & HOISTS.</p> <p>The small amount of this class of plant used by some concerns will usually be such that the one Service Order is sufficient for most cases. If the expense relating to material handling, however, is recovered separately in costs from the general shop expenses, then it may be desirable to analyse accordingly so that the amount of depreciation, etc., to be charged to material handling can be correctly ascertained.</p>	<p>The extent of the equipment used will decide the amount of analysis required with this item. When separate plant is used for material handling, etc., as distinct from the use of, say, conveyors in each department of the factory, the subdivision into three accounts may be sufficient. The amount of plant used by each department will vary to a considerable extent, and each of the following accounts should therefore be analysed to departments—</p> <p>CRANES intended to include all travelling and stationary cranes, lifting tackle, etc.</p> <p>HOISTS to include all lifts which may form part of the permanent buildings, etc.</p> <p>CONVEYORS, including automatic conveyors, shoots, slipways, etc.</p>	<p>A6-1</p> <p>A6-2</p> <p>A6-3</p>

CAPITAL EXPENDITURE (Additions)—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 13	<p>SPECIAL PLANT. Most concerns require special kinds of plant, which can only be classified as such owing to their great variety. This class of plant may, therefore, include case hardening, baking and drying ovens, smithy, etc.</p>	
S.O. 14	<p>MACHINERY, FIXED. To include all producing machinery and counter-shafting only, but exclusive of loose tools, equipment, and belting, etc. When it is desired to obtain a record of each piece of machinery, numbers should be allocated to and fixed on each machine. The number is then quoted when work is done on any machine.</p> <p>The analysis of the Service Orders relating to fixed machinery will partly depend upon the extent of the equipment and partly the method used for recovering factory expenses in costs. For instance, when a separate machine rate is used for each machine tool or group rates for each class of machine tools, the analysis should have regard to this form of classification as well as that of departments; in other words, the analysis may firstly proceed by departments, and secondly, according to the class of machinery in use, alternately, firstly by class and secondly by departments; assuming the former, the Service Orders may be allocated as follows—</p> <p><i>Heavy Machine Shop</i>—MILLING MACHINES PLANING MACHINES BORING MILLS GRINDING MACHINES, Etc. <i>Light Machine Shop</i>—LATHES (Engine) LATHES (Capstans) DRILLS <i>Woodworking Shop</i>—CIRCULAR SAWS BAND SAWS MORTISING MACHINES MOULDING MACHINES</p>	<p>A7-1 A7-2 A7-3 A7-4</p> <p>A8-1 A8-2 A8-3 A8-4 A8-5 A8-6 A8-7 A8-8 A8-9 A8-10 A8-11</p>

CAPITAL EXPENDITURE (Additions)—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 15	<p>MACHINERY, LOOSE. Comprising all loose equipment supplied with each machine tool, bench drills, etc., i.e. such machinery as is not a permanent fixture, as distinct from loose tools.</p>	
S.O. 16	<p>BUILDINGS AND LAND. This Service Order will also include roads and fences, etc., in addition to the cost of each building. When the factory premises are fairly large and consist of more than one building, symbols or letters should be given each building, and a separate Service Order allocated. The cost of special foundations for machine tools is sometimes charged to this account as forming part of the building, and when this method is adopted, care must be taken to see that the book values are adjusted when special foundations become useless owing to the removal or re-arrangement of any machinery. When a machine is moved and new foundations are required, it is usually the practice to charge the cost of new foundations to the repairs and maintenance of buildings.</p>	<p align="center">A9-1 A9-2</p>
	<p>The necessity of allocating separate Service Orders to loose machinery will invariably arise with very large concerns, as the amount of capital expended upon this item will usually be found out of proportion to the value of fixed machinery if proper control is not exercised. The various types of loose machinery should therefore be classified and Service Orders allocated to each class similar to the following— <i>Heavy Machine Shop</i>—PNEUMATIC DRILLS <i>Fitting Shop</i>—BENCH DRILLS, Etc</p> <p>The subdivision of Service Orders relating to buildings and land will depend upon the size and location of the premises. If, therefore, the <i>Works</i> comprise several buildings which are situated either in the one or different localities, the subdivision would naturally be allocated to each building, but in those cases where the works comprise only one building the main Service Order may be further analysed to departments, alternatively, the cost of new buildings can be analysed to show the expenditure on the following lines— <i>Buildings</i>— GENERAL MASONRY WORK may be further analysed as walls, floors, roof, plastering, etc., if desired. WOOD WORK, which includes all doors, windows, roofing, flooring, etc. METAL WORK, including metal doors, windows, iron railings, gutters, girders, trusses, etc. PLUMBING, to include water, gas, and sewer connections, etc. <i>Land</i>—ROADS FENCES, Etc.</p>	<p align="center">A10-1 A10-2 A10-3 A10-4 A11-1 A11-2</p>

CAPITAL EXPENDITURE (Additions)—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.	
S.O. 17	<p>FIXTURES AND FITTINGS, WORKS. To include all partitions, benches, bins, racks, desks, foremen's offices, etc. In some instances there may be included with this Service Order telephone fittings, lighting fittings, etc. when not separately classified.</p>	<p>With large concerns, fixtures and fittings may be classified as permanent fixtures and loose fixtures. Permanent fixtures would therefore include such items as partitions, etc., which form part of the main building and loose fixtures will comprise work tables, desks, and benches when not forming part of main building or structure, etc.</p> <p>WORKS FIXTURES AND FITTINGS, LOOSE WORKS FIXTURES AND FITTINGS, FIXED The sub-analysis of the above item will differ with almost each factory, as lighting fittings and telephone fittings may be included here if Service Orders are not allocated to the two latter accounts.</p>	A12-1 A12-2
S.O. 18	<p>FIXTURES AND FITTINGS, OFFICE. Intended to include only those items which relate to the office departments as distinct from the factory</p>	<p>OFFICE FIXTURES AND FITTINGS, LOOSE OFFICE FIXTURES AND FITTINGS, FIXED</p>	A13-1 A13-2
S.O. 19	<p>TOOLS. To include all bench tools, chucks, vices, jigs, gauges, etc., and special tools for general purposes. The subdivision of this class of Service Orders will entirely depend upon the nature of the industry and extent of tool equipment. The division into perishable tools and permanent tools will, however, generally meet most cases.</p>	<p>The extent and nature of the tool equipment will decide the amount of analysis necessary for tools. Service Orders may therefore be allocated to perishable tools and permanent tools alternatively, the division made on the following or similar lines— Tools, to include chucks, faceplates, vices, and special tools for general purposes. Tools, to include twist drills and taps (above $\frac{3}{8}$ in. diameter), reamers, milling cutters, etc. Tools, to include taps and small drills (under $\frac{3}{8}$ in. diameter), hammers, files, screw-drivers, and other perishable tools. (Special tools may also be analysed according to the products for which they are required.)</p>	A14-1 A14-2 A14-3
S.O. 20	<p>PATTERNS. Intended to include all new patterns made for general production. This Service Order will not include special patterns made to customers' orders.</p>	<p>The expense of new patterns may be analysed to show the amount incurred by each class of product or divided into two main groups, i.e.— WOOD PATTERNS METAL PATTERNS</p>	A15-1 A15-2

REPAIRS, MAINTENANCE AND UPKEEP

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
	<p>The expenses incurred in reference to the repair and maintenance of each class of "Assets" will be collected by means of the Service Orders allocated to each class. To facilitate the control of these items it may be desirable that special plant repair orders be used for all work to be done over a certain amount, as this procedure will ensure that all repair jobs be brought to the attention of some responsible official for sanction.</p> <p>The analysis of the repairs and maintenance expense and the allocation of Service Orders will follow on similar lines to that described for capital expenditure above, and as a description has already been given of the various items which are covered by each of these Service Orders, only the additional information necessary is stated below.</p>	
S.O. 50	<p>MOTIVE POWER PLANT.</p> <p><i>Power Plant.</i> If further analysed as described for "Capital Additions," the Service Orders may be allocated as follows— Boilers (M1-1a), Stokers (M1-1b), Economizers (M1-1c), Water Softening Plant (M1-1d), etc. STEAM DISTRIBUTION PLANT ELECTRICITY GENERATING PLANT ELECTRICITY DISTRIBUTION PLANT COMPRESSED AIR PLANT GAS PRODUCING PLANT</p>	M1-1 M1-2 M2-1 M2-2 M3-1 M4-1
S.O. 51	TRANSMISSION PLANT.	M5-1 M5-2 M5-3
S.O. 52	CONVEYORS, CRANES, AND HOISTS.	M6-1 M6-2 M6-3
S.O. 53	SPECIAL PLANT.	M7-1 M7-2 M7-3 M7-4

REPAIRS, MAINTENANCE AND UPKEEP—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 54	<p>MACHINERY, FIXED. The machine number must be quoted on all time cards and stores requisitions, etc.</p> <p><i>Heavy Machine Shop</i>—MILLING MACHINES PLANING MACHINES BORING MILLS GRINDING MACHINES M8-1 M8-2 M8-3 M8-4 M8-5 M8-6 M8-7 M8-8 M8-9 M8-10 M8-11</p> <p><i>Light Machine Shop</i>—LATHES (Engine) LATHES (Capstans) DRILLING MACHINES M8-1 M8-2 M8-3 M8-4 M8-5 M8-6 M8-7 M8-8 M8-9 M8-10 M8-11</p> <p><i>Woodworking Shop</i>—CIRCULAR SAWS HAND SAWS MORTISING MACHINES MOULDING MACHINES M8-1 M8-2 M8-3 M8-4 M8-5 M8-6 M8-7 M8-8 M8-9 M8-10 M8-11</p> <p><i>Heavy Machine Shop</i>—PNEUMATIC DRILLS <i>Light Machine Shop</i>—BENCH DRILLS, Etc. M9-1 M9-2</p> <p><i>Buildings</i>—GENERAL MASONRY WORK WOODWORK METAL WORK M10-1 M10-2 M10-3 M10-4 M11-1 M11-2</p> <p><i>Land</i>—ROADS FENCES, Etc.</p>	
S.O. 55	<p>MACHINERY, LOOSE.</p>	
S.O. 56	<p>BUILDINGS AND LAND. Intended to include pointing and painting, etc., to existing buildings only, as distinct from wood partitions, racks, and movable fixtures on S.O. 57, S.O. 58; departmental symbols or letters to be quoted on time cards and stores requisitions in each case.</p>	
S.O. 57	<p>FIXTURES AND FITTINGS, WORKS.</p>	M12-1 M12-2
S.O. 58	<p>FIXTURES AND FITTINGS, OFFICES.</p>	M12-3 M12-4
S.O. 59	<p>TOOLS.</p>	M13-1 M13-2
S.O. 60	<p>PATTERNS. To include renovation of existing patterns used for general production purposes. This must not include repairs to special patterns made against customers' orders.</p>	M14-1 M14-2

RE-ARRANGEMENT AND ALTERATIONS

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
	<p>The expense of re-arranging and altering existing plant is collected by means of Service Orders, and the numbers allocated to this class of expense will be very similar to repairs and maintenance, excepting that certain of those items will not be included.</p>	
S.O. 100	<p>MOTIVE POWER PLANT.</p> <p><i>Power Plant—</i> STEAM RAISING PLANT STEAM DISTRIBUTING PLANT ELECTRICITY GENERATING PLANT ELECTRICITY DISTRIBUTION PLANT COMPRESSED AIR PLANT GAS PRODUCING PLANT</p>	R1-1 R1-2 R2-1 R2-2 R3-1 R4-1
S.O. 101	TRANSMISSION PLANT.	R5-1 R5-2 R5-3
S.O. 102	CONVEYORS, CRANES, AND HOISTS.	R6-1 R6-2 R6-3
S.O. 103	SPECIAL PLANT.	R7-1 R7-2 R7-3 R7-4
S.O. 104	MACHINERY, FIXED.	R8-1 R8-2 R8-3 R8-4 R8-5 R8-6 R8-7 R8-8 R8-9 R8-10 R8-11

KE-ARRANGEMENT AND ALTERATIONS—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 105	BUILDINGS AND LAND. Buildings—GENERAL MASONRY WORK WOOD WORK METAL WORK PLUMBING Land—ROADS FENCES, Etc. WORKS FIXTURES AND FITTINGS, LOOSE WORKS FIXTURES AND FITTINGS, FIXED OFFICES FIXTURES AND FITTINGS, LOOSE OFFICES FIXTURES AND FITTINGS, FIXED	R10-1 R10-2 R10-3 R10-4 R11-1 R11-2 R12-1 R12-2 R12-3 R12-4
S.O. 106	FIXTURES AND FITTINGS, WORKS.	
S.O. 107	FIXTURES AND FITTINGS, OFFICES.	

GENERAL SHOP EXPENSE

S.O. 201	<p>The undermentioned Service Orders are intended to cover all general shop expenses which require analysing either to departments or processes. The extent of this class of orders and the amount of analysis required will depend upon the special conditions of each factory and the nature of trade carried on, therefore a few items are given by way of illustration only and to demonstrate the main object of analysing and collecting the sundry factory expenses by means of Service Orders. Many other orders will require to be used, but the undermentioned will be sufficient to indicate their general nature.</p> <p>INDIRECT LABOUR. Intended to give an analysis of all indirect labour. This Service Order may be arranged to give an analysis either by departments or by the nature of the work performed. With some concerns the departmental analysis may be as follows—</p> <p>STORES AND RECEIVING DEPARTMENT. Includes wages of all assistants other than salaried officials.</p> <p>SUPERVISION—Department X Department Y Department Z To include wages of foremen, etc., and assistants, but exclusive of salaried officials.</p>	<p>GI-1X GI-1Y GI-1Z</p>
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GENERAL SHOP EXPENSE—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 202 S.O. 203	POWER DEPARTMENT REPAIR DEPARTMENT	GI-2X GI-2Y GI-2Z
S.O. 204 S.O. 205	DESPATCH DEPARTMENT TOOL STORES	GI-3X GI-3Y GI-3Z
S.O. 206	GENERAL SHOP LABOURING	GI-4X GI-4Y GI-4Z
	INSPECTION AND VIEWING—Department X Department Y Department Z Includes wages of inspectors, etc., and assistants.	
	CLEANING AND SWEEPING—Department X Department Y Department Z	
	SHOP CLERKS—Department X Department Y Department Z	
	OILING AND CLEANING MACHINES—Department X Department Y Department Z	
	Intended to include time of direct workers when engaged in oiling and cleaning machine tools, etc.	GI-5X GI-5Y GI-5Z
	UNALLOCATED TIME—Department X Department Y Department Z	GI-6X GI-6Y GI-6Z
	This account will require to be further analysed to show the cause, i.e.— Waiting for Materials—Department X Department Y Department Z	GI-61X GI-61Y GI-61Z
	Belt Breakdown—Department X Department Y Department Z	GI-62X GI-62Y GI-62Z
	Etc.	
	GENERAL LABOURING—Department X Department Y Department Z	GI-7X GI-7Y GI-7Z
	HANDLING MATERIALS—Department X Department Y Department Z	GI-8X GI-8Y GI-8Z
	Intended to include the moving and trucking of materials in each department.	

MISCELLANEOUS

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 207 S.O. 208 S.O. 209 S.O. 210	<p>LIGHT, HEAT, AND POWER. Intended for use when all power is purchased from outside.</p>	<p>MISCELLANEOUS</p> <p>TRANSPORTS. The Service Orders under this heading are intended to include all charges relating to motor vans and horse-drawn vehicles, etc., and the extent of the analysis will depend upon the size of the "service," and whether the transports are engaged in carting raw materials only or both incoming and outgoing materials. In the latter case the expense is collected so that the Sales Department are charged with their correct proportion. In the case of motor vans, Service Orders may be allocated as follows— DRIVERS' AND ASSISTANTS' WAGES (Analysed to each van) REPAIRS AND RENEWALS (Analysed to each van) CLEANING, Etc. (Analysed to each van) PETROL CONSUMED (Analysed to each van)</p>
	<p>ELECTRICITY GAS WATER FUEL</p>	
	<p>GENERAL PURPOSES. Intended to include oil, rags, waste, emery paper, etc., and all such items required by the factory departments. Metal of any description must not be drawn from stock on this Service Order.</p>	
S.O. 211	<p>With those concerns where the quantity of sundry materials consumed by each department is large, this order should be analysed so that the amount used by each department is obtained. Department X Department Y Department Z</p>	<p>S2-1 S2-2 S2-3 S2-4 S3-1* S3-1* S3-1*</p>

MISCELLANEOUS—(contd.)

Example of numbering Service Orders.	CLASSIFICATION AND DESCRIPTION OF ASSETS.	Example of numbering Service Orders.
S.O. 212	<p>WELFARE AND CANTEN EXPENSES. Intended to include all expenses in connection with welfare sports, etc., also of canteen, but exclusive of general repairs and maintenance of canteen buildings.</p>	S4-1
S.O. 213	<p>WELFARE The order may be analysed to show the amount of expenses as between the male and female employees also apprentices or according to the various forms of welfare provided.</p> <p>CANTEN EXPENSES Intended to cover any work done by the company's employees other than "additions" or expenses incurred, such as payment of wages to canteen staff, etc.</p> <p>COMPLAINTS. To include all expenditure in regard to rectifying, repairing, or altering of the company's products which have been returned by a customer due to faulty workmanship and/or materials or design, damage in transit, etc. Any work in this direction should be done on a special repair order, and the time cards and stores requisitions will quote the number of the repair order.</p>	S5-1
S.O. 214	<p>EXPERIMENTAL. To include all expenditure incurred in regard to experimental or development work carried out in connection with the company's products.</p> <p>EXHIBITION EXPENSES Intended to include all expenses incurred in this direction, such as labour and materials used in erecting stands, wiring, carriage on exhibits, etc. analysed according to requirements.</p>	S6-1 S6-2 S6-3
	<p>EXHIBITION EXPENSES Intended to include all expenses incurred in this direction, such as labour and materials used in erecting stands, wiring, carriage on exhibits, etc. analysed according to requirements.</p>	S7-1

SHOP COST. (See **FACTORY COST.**)

SHRINKAGE IN STORES. (See **STORES LOSSES AND SHRINKAGE.**)

SINGLE OR OUTPUT COSTING. A term often used when referring to the method of costing employed in such businesses as supply one rather than many products, and where it is desirable to find the actual or average cost of one unit, weight, measurement or container, such as per ton, per yard, per 1,000 bricks, per barrel or a sack of flour. For the purpose of explaining the principles of this method of costing a description of the coal mining system is chosen.

Coal Mining Costs. In any system of cost accounting for this industry the following considerations have to be borne in mind before proceeding with the first development operation, namely, the sinking of the shaft—

1. That development, equipment, and plant are a first expenditure before coal mining can commence and are, therefore, a capital cost.

2. That this cost is not a permanent asset, as it depreciates as the coal is won and must, therefore, be provided for by being included in the cost of operating. This provision is

Form No. 95.

CONSTRUCTION OF SHAFT. feet deep		
For the Collery.		
COST for. ending 19 feet excavated.		
	Per Foot of Depth.	Per Cubic Yard.
Sinker and his men		
Blacksmiths and fitters		
Boilerman, enginemen, and labourers		
Superintendence—		
Concreting : Material and labour.		
Stores, timber, etc.		
Repairs		
Coal and power		
Insurance and depreciation		
Office and administration expenses.		
Total cost per foot and cubic yard		

made by dividing the capital cost by the estimated tonnage underground, which gives a rate per ton necessary to redeem this cost.

3. That capital cost ceases after the mine has been developed and equipped, and operating charges commence when coal is being won.

4. That additions and improvements after a period of time should be capitalized and recovered in costs as a charge on the estimated tonnage of coal remaining underground as 2 above.

5. That ordinary repairs and replacements are an operating expense.

When shaft sinking is proceeding, care must be taken that the estimated costs are not being exceeded. Weekly costs should, therefore, be made up showing labour, stores, and material expended, and depth of shaft sunk during the week. This will vary with the conditions met with, and Form 95 is a specimen account which shows the ordinary items occurring in shaft sinking.

Output of Coal. When operations have commenced all coal brought to bank should be weighed, averaged, and totals sent to the wages office, as the weight is the basis of the Wages Book entry.

Wages Bill. Wages are made up from the particulars supplied of the weight of coal brought to bank, and from the timekeeping particulars relating to men employed on an hourly basis. The sheets should provide for all necessary information, and have columns to show all the off-takes. Separate wage sheets should be used for production wages, and maintenance wages to get the actual cost of these groups. Where a man has been working in different parts of the pit, the total amount of wages due to him should be brought together in the sheets by a transfer column, which will allow the totals to balance.

When the pay sheets are completed the total amount payable is divided into the weekly output of disposable coal and a wages pit head cost found; a summary should then be made up and sent to head office for the purpose of issuing the wages cheque, the wages, of course, being paid by a staff sent from head office.

Stores. When a mine has reached its full operating capacity it is a big consumer of stores and materials, which are subject to destructive wear and tear by reason of the heavy work they are called upon to perform. Furthermore, all the equipment

Form No 96.

STATEMENT OF COAL PRODUCED

FOR WEEK ENDING.....19

PERIOD.	Coal Produced.	Coal Disposed of.	Coal to Locos. and Boilers.	Miners' Coal.	Unsaleable Coal.	Firedlay.
This Week						
Last Week						
This Year to Date . .						

PERIOD.	EMPLOYEES.					Av. Coal per Day.		Av. Wage per Day.	
	On Books.	Absent.	Per Cent. Absent.	Days Worked.		Per Tub.	Per Man.	Under-ground.	Surface.
This Week									
Last Week									
This Year to Date . .									

and plant must be kept in good repair to maintain the necessary output for the successful working of the concern.

As the workings advance and the length of haulage increases, more tracks have to be laid and maintained, tubs wear out and have to be replaced, roads must be timbered—all an increasing expense, which has to be met. In time a period will arrive when very heavy expenditure must be incurred by the replacement of equipment, which cannot obviously be charged against the cost of obtaining the coal in the period in which this expense is incurred. An estimate of the life of the equipment should, therefore, be made and the cost spread over this period and a weekly or monthly charge made to the cost of coal produced.

A proper method of handling stores should, therefore, be in existence, minimum and maximum quantities fixed, and no stores issued without a stores requisition signed by a responsible official. To afford a check upon the Stores Department bin cards should be provided, and stock record cards kept by the Cost Department, so that comparisons can be made periodically.

Bulky and heavy items of stores, such as rails, timber, etc., which cannot easily be taken into the stores, are generally stacked around the pit mouth. They should, therefore, be treated in a similar manner to the other and less bulky items, and nothing allowed to go down the shaft unless a stores requisition is produced.

With regard to old pit props, rails and tracks, etc., it should be the duty of an official to see that all of these items are brought to bank to be disposed of as scrap, as there may be a very heavy loss in this direction if discarded plant and material are allowed to remain in the mine.

The consumption of stores in a colliery being of a very wasteful character, comparisons should be made week by week and any increase questioned.

Steam and Power. Steam and power are an expense which is difficult to allocate, and care should be taken to see that the allocation is as near as possible, and that a fair price is charged to this department for the coal used. The layout of the plant of any colliery will depend on the available land, but care should be taken that steam is not carried too far a distance from the boilers to the plant needing it, as there is always a tendency for uncontrollable waste to occur when carrying steam any distance through pipes.

The coal consumed by the boiler house is naturally the

Form No. 97.

COMPARATIVE TONNAGE STATEMENT

FOR MONTH OF 19

DISPOSAL OF COAL.	CURRENT MONTH.				THIS YEAR TO DATE.			
	Screened.	Nuts.	Etc.	Total.	Screened.	Nuts.	Etc.	Total.
Shipping coal . . .								
Landsale coal . . .								
Locomotive coal . . .								
Boiler . . .								
Miners . . .								
Coal to washery . . .								
Miscellaneous . . .								
Total . . .								
<i>Add—</i>								
Coal in stock and in wagons at beginning of month . . .								
Total . . .								
<i>Less—</i>								
Coal in stock in wagons at end of month . . .								
Production of coal for month and year . . .								

produce of the mine, and the quantity often used is unsaleable, and for this reason is sometimes not charged to costs. This practice is obviously wrong, because if the coal was not available, better coal would be used or other coal purchased. The coal which cannot be sold should be charged to the boilers at the cost of production based upon the average cost of the preceding month. On the other hand, if saleable coal is used, it should be charged at cost or market price, whichever is lower.

Coal at a colliery is naturally plentiful and easy of access. There is a tendency, therefore, to waste coal by burning it under uneconomical conditions and by bad firing of the boilers, and the result is an excessive cost of generating steam.

Electrical energy is now generally used in the mining industry, and may be either generated at the colliery or purchased from an electric supply undertaking. In such cases the allocation of electrical energy is not as difficult as with steam. If meters are installed about the mine, the transmission of power to the pumping gear, haulage gear, screens, washery, ventilating, fans, etc., can be checked at frequent periods, and the actual consumption of electricity by each section of the plant ascertained and charged to it in the weekly costs. If electrical cutters are used in the mine, the energy consumed should be charged as an underground cost and not as a mine overhead expense.

Other Colliery Costs. The remaining expenses chargeable to production are timber, haulage, ventilation, screening, washing, ponies, mine office expense and management, together with expenses incidental to coal getting. These expenses should be shown separately on the cost sheet, together with the cost of stores, welfare, levies, and the provision made for surface damage or subsidence.

Final Items in Coal Mining Costs. After a pit head cost has been arrived at there will be other items that go to make up the total cost figure; these are depreciation, depletion, obsolescence, insurance, compensation, general charges, rent and rates, selling expenses, and contingent reserves. These items are better treated by making a monthly cost return, and arrangements should be made for the transfer from weekly to monthly costs, which should be planned to fit in with the financial accounts at head office.

Statistics. The coal industry lends itself very well to the compilation of statistics relating to the cost per ton of coal produced, and every opportunity should be taken of placing before the management statistical matter relating to coal

COST OF COAL PRODUCTION AT PIT HEAD

DESCRIPTION.	CURRENT WEEK.		THIS YEAR TO DATE.		Percentage.
	Amount.	Cost per Ton.	Amount.	Cost per Ton.	
Underground labour.					
Surface labour.					
Engineers and mechanics.					
Timber					
Stores and materials					
Electricity					
Boiler coal					
Horse keep					
National insuran.					
Royalties					
Welfare levies					
Maintenance reserve					
Surface damages					
Supervision and mine office expenses					
Sundries					
TOTAL					

produced, coal sold, shipped, and the comparative costs of maintenance, power, sales, etc., for any given period.

Form No. 99.

COST OF SALES AND INCOME ACCOUNT							
FOR MONTH OF.....19....							
	CURRENT MONTH.			THIS YEAR TO DATE.			
	£	s.	d.	Average per Ton.	£	s.	d.
<i>Sales—</i>							
Shipping coal . .							
Landsale coal . .							
Locomotive coal . .							
Boiler coal . .							
Miners' coal . .							
Coal to washery . .							
Miscellaneous . .							
Gross sales (coal produced)							
<i>Less—</i>							
Railway leadage . .							
Wagon hire . .							
Commissions . .							
Wayleaves . .							
Other surface royalties							
Total deductions . .							
Net receipts for coal at mine . .							
Less total of operating and selling costs . .							
Net profit on coal . .							
<i>Add—</i>							
Sundry income . .							
Brickworks . .							
Dwelling houses . .							
Washery, etc. . .							
Total income for month and year to date . .							

SPECIFICATION OF MATERIALS. (See BILL OF MATERIAL.)

SPOILAGE LOSS. (See DEFECTIVE WORK—COST OF, also STORES LOSSES AND SHRINKAGE.)

STANDARD COSTING. A method of predetermining costs and the comparison of the actual with the estimated costs during process of manufacture. Standard costing is often referred to as "predetermined costing."

Fundamentally there are two different methods of costing. The first is to ascertain the cost of an article, order, or process *after* the work is finished, the second is to estimate the cost *before* the work is commenced with the object of "controlling" expenditure during the period the work is in progress. The former method is attained by adopting one or a combination of the various methods of cost finding, described on page 116, and although of long date is still used by the majority of manufacturers. The latter method, however, is more modern, and is now generally in operation among the larger and well-organized concerns, where more constructive cost data is needed, which cannot be obtained by the use of the older method.

A standard cost is a predetermined cost based upon the presence of a given set of conditions, and the application of this method is accomplished in the comparison of the actual with the standard, which may be done in the aggregate, or by process, product or department. Standard costs may, therefore, be figured for specific operations such as plating, lacquering or refining, or for the manufacture of individual articles such as screws, nuts and bolts, ingots, castings, boots and shoes, etc., and for the generation of electricity, steam or compressed air, etc.

The question of comparison as referred to with standard costing is a very different thing to comparing the actual job costs singly with the estimates. With standard costs a comparison of detailed operations is made on the exception principle, and the great advantage of this method is that *tendencies* are disclosed, thus enabling the policy of a business to be determined rapidly and with greater precision than is possible with the older method of costing.

When standards are being set, which should be done on the basis of the factory operating at its full normal output capacity, and at a reasonable rate of efficiency, a basis of measurement or unit of output must firstly be agreed, and here one of the advantages of a computed standard cost becomes apparent. It conveys far more to the directors that their cost is represented by 140 for June, 138 for July, and by 141 for

August than to be informed that the cost for June was 92 per cent of the corresponding cost of last year, for July 88 per cent, and for August 95½ per cent of August last year.

Standard labour costs, which are the costs of the standard time required to perform the operation, may be set up on the basis of past cost records, provided that the conditions under which they were obtained are recorded. On the other hand, they may have to be modified to suit new or anticipated conditions. Where piece work, premium or bonus methods of remunerating labour are in use, these may be taken as standards.

The fixing of standard expense rates is comparatively easy, and the first step in this direction is to estimate the standard direct hours or total direct labour on the basis of the factory working at its full normal maximum output capacity and at a reasonable rate of efficiency. With such a figure as the basis a standard is set for all items of expense, but for the convenience of control all expenses are grouped, firstly, according to fixed and variable items, and secondly, by class, i.e. indirect materials, indirect labour, depreciation, rates, taxes and insurance, power, light and heat, etc. Such grouping, however, will be determined by the nature and size of industry which is being carried on.

When a production or works order is issued to the factory the standards for labour, materials, and expenses are stated, so that the managers of the respective producing departments are informed of the maximum amount and quantities allowed on each operation or piece. The actual cost of each operation or piece can, therefore, be compared with the standard and the reason for any excessive costs shown. By this means preventable losses can be reduced to a minimum, or entirely eliminated *whilst the work is in progress*.

The final cost of a particular job, order or operation is only compiled for those orders which do not come within the predetermined limits, and the total of such costs, less standard, indicates the exact amount of expense incurred by inefficient working.

On the completion of each cost period, which may be weekly or monthly, efficiency statements are prepared. The number of statements and the amount of detail to be shown will vary with each factory, but the following list indicates the various kinds that are usually prepared. The separate statements may be compiled for individual articles, by class of product, or for each department.

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The fixing of standard expense rates is comparatively easy, and the first step in this direction is to estimate the standard direct hours or total direct labour on the basis of the factory working at its full normal maximum output capacity and at a reasonable rate of efficiency. With such a figure as the basis a standard is set for all items of expense, but for the convenience of control all expenses are grouped, firstly, according to fixed and variable items, and secondly, by class, i.e. indirect materials, indirect labour, depreciation, rates, taxes and insurance, power, light and heat, etc. Such grouping, however, will be determined by the nature and size of industry which is being carried on.

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1. Variations in Factory Cost—

Direct Labour due to—

- (a) Change in rates of pay.
- (b) Efficiency of operations.
- (c) Unallocated time (i.e. idle time).
- (d) Other causes.

Direct Materials due to—

- (a) Change in price.
- (b) Consumption.
- (c) Spoilt work.

Factory Expenses due to—

- (a) Indirect labour—change in rates of pay.
- (b) Indirect labour—unallocated time.
- (c) Indirect materials—change in price.
- (d) Indirect materials—quantity consumed.
- (e) General shop expenses—suitably analysed, etc.

2. Variations in Selling and Administrative Expenses—

Salaries due to (a) change in rates paid.
(b) number employed.

3. General Summary—

- (a) Actual cost of actual output.
- (b) Standard cost of actual output.
- (c) Standard cost of normal output.
- (d) Increase or decrease of actual cost (a) to standard cost (b).
- (e) Ratio of actual (a) to normal output (c).

The difference between 3 (a) and (b) is shown in 3 (d) and the details of this amount given in statement 1 above.

Standard costing is simply a special method of applying the principles of cost accountancy to industries where the methods of production have been standardized, the probable cost of each process ascertained, and the figures used to control production. This form of control enables a plant to regulate its daily and weekly output so that the actual costs are kept under control and within the limits of the estimate.

The use of standard costing has now become almost universal, and most firms operate on the basis of "standards," i.e. a standard labour cost for each operation or group of operations, standard material cost, and a standard overhead expense rate determined according to the volume of production over a definite period of time. All production is extended

at the standard cost and then adjusted by the increase or decrease over standard. Under such a method the detailed clerical work involved by ordinary cost-finding methods is eliminated and results produced promptly at the end of each week or month. (See also MANAGEMENT THROUGH ACCOUNTS.)

STANDING EXPENSES. (See CONSTANT EXPENSES.)

STANDING WORKS ORDERS. (See SERVICE ORDERS.)

STOCK APPROPRIATION. (See STOCK RECORD CARD.)

STOCK BALANCE CARD. (See STOCK RECORD CARD.)

STOCK CARD. (See STOCK RECORD CARD.)

STOCK CONTROL CARD. (See STOCK RECORD CARD.)

STOCK RECORD CARD. A record card of all items of materials and goods in stock. A stock record card will serve a number of purposes, the chief of which may be given as—

1. It enables a perpetual inventory of all stores to be maintained of quantities.
2. Provides a basis of check upon the stores.
3. Facilitates the pricing of stores requisitions.
4. Greatly assists in the control of stocks.
5. Enables the purchasing of standard materials to be carried out with greater certainty and regularity.

Whether all or only a few of the above advantages will accrue to any firm depends upon the standard of efficiency attained in regard to the organization of the stores and production methods, and also the nature of the trade carried on. With some concerns, for instance, the small amount of materials stored or consumed may be such that an elementary form of material control is all that is necessary. A simple form of stock record will, therefore, be used and which may be ruled to show only receipts and issues of materials with the balance on hand. Such a stock record card is illustrated on page 419, and will be found very useful, as it provides information regarding the quantity of stock on hand and the means for pricing stores requisitions. With large concerns, however, a more detailed record may be required on account of the large quantities of materials consumed, and the necessity of providing suitable data on which to anticipate future requirements and the placing of orders. The ruling of the stock record card in such circumstances will vary with each concern, but in most instances there will be four essential items to be recorded, namely, (1) materials purchased, (2) balance in stock, (3) appropriations or required for orders, and (4) balance available.

A specimen stock record card, size 8 in. by 5 in., is shown

on page 412. It will be noted that the elementary type of perpetual inventory, referred to above, is represented by the "balance in stock" column, and that the remaining columns relate to the other information stated above.

The work of entering all receipts and issues, also quantities purchased, etc., is the same as described for the more simple form of card, illustrated on page 419, but the additional information in regard to appropriations, etc., will be made at the time the production order is issued to the factory. The object now being to reserve sufficient material for the particular order, the quantity is entered in the "appropriations" (quantity) column and deducted from the "balance available" column.

The size and form of rulings for stock records will vary to a great extent, and the illustration on page 414 is a specimen record sheet, size 10 in. by 8 in., used by a Planning Department in place of the Cost Department. When such a department keep the stock records, they will price all stores requisitions before being passed on to the Cost Department.

The method of entering up the "record of material" form is briefly as shown on next page.

Particulars of all purchase orders placed are entered in columns 1, 2, 3, and 4. The quantity delivered and placed in stock is inserted in column 5 and added to the balance of columns 6 and 10. Issues of materials to the shops are entered in column 7 and deducted from column 6. Materials appropriation or reserved for orders are entered in column 8. This quantity is then deducted from the figure shown in column 10, and the difference which represents the balance available for future appropriation is then entered in column 10. In the event of insufficient materials being available, and as shown in column 10, the difference or "shorts" are inserted in column 9.

STOCK RECORD SHEET. (See STOCK RECORD CARD.)

STOREKEEPER—RESPONSIBILITIES AND DUTIES OF.

The responsibilities and duties of a storekeeper will be onerous in a well-organized stores, and the necessity of employing a thoroughly capable storekeeper will be apparent. The operations of storekeeping may be regarded as commencing with the receipt of goods or materials, and his status may be likened to that of a cashier. He is responsible for the whole of the goods delivered to him, and this responsibility continues until he has issued them against authorized delivery notes or vouchers.

The duties of a storekeeper may, therefore, be briefly summarized as follows—

1. To accept only materials or goods into his store when accompanied by a written record stating the quantity and description of the various items, also a note of the purpose for which they are required, and to sign for their receipt from the Receiving Department. (See form of Inwards Goods Note, illustrated on page 368.)

2. To keep all items of stock in their correct positions.

3. To keep the stores clean and tidy.

4. To prevent any unauthorized person from entering the stores.

5. To issue materials against a written authority only, which should be properly and correctly made out.

6. To check all requisitions he receives, which have been issued against a bill of material, production order, or service order.

7. To check at frequent periods the quantity of goods contained in each bin, or rack, etc., with the quantity stated on the bin card.

8. To watch the stock levels and report—according to the recognized routine of replenishing stock—when the minimum is reached.

STORES BALANCES—VERIFICATION OF. (See RECORD OF BIN INSPECTION.)

STORES CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS, also STORES—FINANCIAL CONTROL OF.)

STORES CREDIT NOTE. Materials issued to the works for manufacturing purposes will sometimes consist of items that cannot be conveniently measured into the exact quantity that will be required for a particular operation or process, and in such cases it may be the practice to issue an item of material in bulk, such as a reel of copper wire, and on completion of the work the balance remaining is returned to the stores. The issue of the bulk supply is made against a stores requisition, and the total quantity credited to stock on both the bin cards and stock record cards. Upon the return of the balance the stores assistants weigh or count the quantity and make out a "stores credit note," which then forms the medium for crediting the job and debiting the stores.

Stores credit notes are, therefore, entered upon the bin card and stock record card as a "receipt," but as a "credit" to the job number or process from which the materials have been returned (see Form No. 102.)

STORES DEPARTMENT—EXPENSES OF. The items which comprise the expenses of a Stores Department will vary with each business and may, therefore, include such expenses as salary of the stores superintendent or storekeeper and his assistants, wages of labourers engaged in moving materials, cost of any facilities, such as lifting tackle, etc., sundry supplies required by this department, also a portion of depreciation, etc., of buildings and fixtures, light and heat, etc., and in some cases the premiums paid on insurance of stocks against fire. (See FIRE INSURANCE.)

The treatment of this expense item in the cost accounts will, firstly, depend upon whether a merchandising business is carried on in addition to manufacturing, and secondly, whether the expense incidental to the storing and handling of materials is recovered in costs separately from the factory expenses.

Merchanted Goods and Raw Material Stocks. In those cases where a merchandising business is also carried on and stocks are held of such items, it will be necessary to apportion the expenses of the Stores Department either on the basis of purchases made, or the value of the respective stocks held over a definite period.

The amount allocated to merchandise is a charge to the Selling Expense Account, whereas the amount relating to raw materials, etc., is a charge to the Factory Expense Account.

If items of merchandise are purchased and shipped direct to customers or redispached the same day as received, the apportionment should be made on the basis of the value of stocks held and not on purchases.

When the expenses incidental to the storing and handling of materials are segregated from those which relate to production or manufacturing only, the total amount of stores expense is allocated to a "Material Handling Expense Account," and the item recovered in costs as a separate percentage to the factory expense and selling expense rates.

In those cases where a merchandising business is not carried on as described above, it is preferable that the expense of storekeeping be allocated to the factory expense and recovered in costs with the expenses of manufacturing, but if this method is not adopted the amount is charged to a Material Handling Expense Account, which is dealt with as a separate item to factory expenses.

STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES. The importance of proper control in a stores

cannot be over-estimated, especially where stocks are very large and run into many thousands of pounds in value. It is not uncommon to find, however, that laxity in the direction of stores supervision and control is still very pronounced. With some firms the annual or half-yearly stocktaking becomes nothing less than a time for making huge adjustments, much to the astonishment and annoyance of the management and officials generally. Furthermore, when stocks are proved to be hopelessly "out" it necessarily follows that most, if not all, of the costs furnished in the interim period are false, because the accuracy of cost accounts depends chiefly on true records in this direction. It is, therefore, quite evident that proper control becomes absolutely necessary.

The principles involved in purchasing and storekeeping have been dealt with under their respective headings, and consideration is now directed to the method of control of the stores as carried out by the Cost Department. A storekeeper is generally supplied with "bin cards" in order that a complete record can be made of all "receipts" and "issues." These cards automatically provide him with a detailed account of the whole of the materials under his charge. The Cost Department, on the other hand, should also keep a separate set of stock cards, the records on which are kept in such a manner that a complete and perpetual inventory of the stores is available at any desired date. These cards, or stock records, are in the majority of instances best dealt with in the Cost Department, owing to the fact that this department must be acquainted with all movements connected with materials and stock, as they will require copies of all stores requisitions, credit notes, etc., also particulars of prices of all materials, all of which are necessary for compiling job, process, or any other costs.

The ruling of a stock record card must be arranged to suit the requirements demanded by individual factories, but the following explanation embodies the essential principles that are applicable to most industries.

Under the heading of "purchasing" the routine in connection with the purchase order is explained, and the first copy of this form was described as being sent to the cost office for stock record purposes. Purchase orders should be dealt with immediately, and on receipt of the copy in the cost office a clerk will post particulars of the order on the stock record card, filling in details under the columns headed "purchased." The copy of the order is then initialled and returned to the

Buying Department. The next step is in connection with the receipt of the goods and either a Goods Received Book or "goods received note" (see page 368) will be used as the medium of recording all items placed in stock. With the system described in connection with inwards goods notes the third copy is sent to the cost office by the buyer, so that the quantity and details of the goods under review can be entered in the columns marked "received" and added to the "balance in stock" column. Further, as and when goods are issued from stock, the storekeeper or his clerk signs the stores requisition and passes same on to the Cost Department. On receipt of this form a clerk in the Cost Department will deal with it in a similar manner, entering up the details under the heading "issues," and carrying down the stock balance. Concerning surplus goods returned to the stores from the works, the particulars obtained from the stores credit note are entered under "received" column, and the balance struck accordingly. Upon reviewing the whole procedure it will be observed that the Cost Department are in possession of sufficient information to enable them to see at a glance the stock or balance in hand of any particular materials in the stores, and furthermore, are consequently in a position to verify the "bin cards" as submitted from time to time by the storekeeper. In the case of "standard" stock materials becoming exhausted or reaching the minimum or re-order quantity, the storekeeper may notify the buyer by means of a "purchase requisition" that further supplies are needed. In this special instance the requisition form should firstly be sent to the cost office in order that the depleted or minimum stock under consideration may be verified, i.e. compared with the details on the stock record card kept by the Cost Department.

If found to be correct, the requisition number, date, etc., are noted in the purchase column on the stock record card, and the clerk initials the requisition and passes same on to the buyer for his attention. When differences arise, and this may often happen, between the stock record cards in the Cost Department and the bin cards, steps should be taken to locate the error before passing the requisition.

It is advised that the stores record clerk shall make periodical comparisons of the record of bin inspection with the stock record cards, and if any differences are shown the matter should be investigated before obtaining sanction from his superiors to make any adjustments. These adjustments are generally dealt with when balancing the stock control accounts,

either monthly, quarterly, or at any specially agreed time in keeping with the general policy of the business.

When goods are manufactured in bulk according to a definite schedule, a list of all materials required for each batch of work may be prepared by the Planning Department or works chemist, etc., and in such cases the Stores, Cost, and the Production Departments concerned should be provided with copies to acquaint them of the various kinds of materials required, and the maximum quantities to be used in any specific job or order. The list of materials so used and generally referred to as a "bill of material" or "material specification" is a very useful document in any cost system. In such an instance the storekeeper is able to check all issues with the list, and the form should therefore be ruled so that a note of all particulars required may be recorded thereon. When bills of material are in use the rulings of the bin card may need to be slightly modified so as to include a column for "appropriations."

The stock records kept in the Cost Department may also require a little adjustment, and on page 422 an illustration is given of the ruling needed for that purpose.

When dealing with materials under this heading the stock record clerk will note from the Cost Department's copy of the bill of materials the goods, or materials, to be appropriated for definite production orders in a similar manner as described for the storekeeper. After a careful study of what has been said relative to purchasing, stores organization, and stores routine, it would be followed that complete supervision in routine and physical control has been accomplished simultaneously. The next step, therefore, is to show how the physical control is interlocked with financial control, and in such a manner that the existing routine may be operated to gain these objectives.

The necessity of proper financial control is of fundamental importance, since it is the determining factor in the accuracy of final records, both in the commercial and manufacturing accounts.

The grouping of materials under suitable headings considerably facilitates the financial control of stocks, and the following main classification is therefore advised—

(a) Control of standard raw materials (i.e. those which comprise the output of the works).

(b) Control of completely manufactured goods bought outside and resold in the same condition as purchased.

(c) Control of goods manufactured in the works which are ready for resale.

With regard to (a) and (b) the accounting transactions of these items in the commercial accounts are—

Dr. Purchases Account.

Cr. Sundry Creditors.

In the cost accounts the control is effected as follows—

(a) *Dr.* Raw Materials Control Account.

Cr. Purchases (Raw Materials).

(b) *Dr.* Factored Goods Control Account.

Cr. Purchases (Factored Goods).

The total value of the stores requisitions, less the amount of stores credit notes, which represents the net value of raw materials issued from stores during a period is then journalized, from summaries prepared in the process of cost finding, as follows—

(a) *Dr.* Work in Progress Account.

Cr. Control Account (Raw Materials).

As and when components, or each batch of work, are completed and passed into the finished stores (c), the value of the work will be journalized as follows—

Dr. Finished Stock Control Account.

Cr. Work in Progress Account.

We now have the saleable product in the finished stores, and issues for dispatch to customers will be dealt with by journalizing the values represented by these stores requisitions as follows—

(b) and (c)—

Dr. Cost of Sales Account (or Trading Account).

(b) *Cr.* Factored Goods Control Account.

(c) *Cr.* Finished Stock Control Account.

The above Journal entries should be made at frequent periods, which may be weekly or monthly, according to the requirements of the business, and at the end of the accounting or financial period, the following adjustments are made—

Losses and wastage in stores as disclosed by the periodical inspection of stocks carried out by the storekeeper, which will be obtained from the "record of bin inspection," will be summarized, and a Journal entry prepared in the Cost Department, thus—

Dr. Stores Losses and Shrinkage Account.

Cr. Raw Materials Control Account.

It is sometimes the practice to debit any losses in the stores

to the Work in Progress Account, and to close the account periodically by transferring from the Work in Progress Account (at the same time that completed work is transferred) to the Manufacturing or Trading Account in the financial books.

With some concerns it may be desirable to subdivide losses and shrinkages under all or some of the following headings—

1. Shrinkage.
2. Losses due to evaporation.
3. Breakages.
4. Loss in turnover (i.e. weighing, counting, etc.).
5. Faulty materials rejected by the works.
6. Obsolete stock, etc.

In conclusion, it will be seen that any of the above forms of stock record cards provide a perpetual inventory of all stores items, either in quantities or weights, and that the Stores Accounts (a), (b), and (c) provide a perpetual inventory in terms of money; furthermore, the stores control accounts form the medium for reconciling the values of all purchases as shown in the financial accounts with the cost accounts.

It will now be perceived that full control over all material has been established, and its use to the various jobs, processes, or operations can be traced, thus completing the first step in founding the materials section of a costing system.

This method of stores control cannot be employed and maintained satisfactorily unless the administration of a works is properly developed. It certainly necessitates proper supervision, and some kind of planning throughout the course of production, and unless such conditions exist a different form of control should be adopted.

STORES—INSPECTION OF. (See RECORD OF BIN INSPECTION, also STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.)

STORES ISSUED BOOK. (See STORES ROUTINE, also STORES REQUISITION.)

STORES LOSSES AND SHRINKAGE. The losses which arise within a stores may be divided into five groups—

1. Losses due to breakages.
2. Losses due to deterioration or evaporation.
3. Losses due to pilferage.
4. Losses due to the breaking up of bulk materials for issue in small lots.
5. Losses due to obsolescence.

It is sometimes the practice to include among the establishment expenses an arbitrary amount to cover all losses in the above directions, but unless some form of control or perpetual check is exercised by the management, any pilferage and carelessness in handling materials will not only continue throughout the year, but may increase to such an extent that considerable losses will be incurred.

Stores losses are of two kinds, namely, preventable and unavoidable, and both of these will occur in each of the groups 1, 2, 4, and 5 above; for instance, the losses or shrinkage caused by the breaking up of bulk materials for issue in small lots are unavoidable up to a certain point, but carelessness on the part of the stores assistants will often be the cause of excessive waste in this direction. Again, a certain amount of breakage cannot be avoided when handling certain kinds of materials, but carelessness will account for unnecessary wastage.

Pilferage, on the other hand, should be detected and the losses in this direction reduced to a minimum.

A form of bin inspection or perpetual check should be provided in order to obtain a record of all stores losses, and the method described under the heading of bin inspection will generally be found suitable for most stores.

The treatment of stores losses in the cost accounts will vary considerably in practice, as the method of recovering expenses in costs may determine the procedure. On the other hand, many concerns transfer the amount direct to Profit and Loss Account. When the expenses relating to the handling of materials are recovered in costs separately from the general shop expenses, the value of stores losses will be charged to that account; in other cases the amount may be included in the general factory expense rate. Any losses arising on factored goods or finished stocks, if stores are under control of Sales Department, should be charged to selling expenses. (See also COST CONTROL ACCOUNTS (MATERIALS SECTION).)

STORES ORGANIZATION AND LAYOUT. Storekeeping involves not only a very large number of transactions, but each of these transactions is in itself manifold, and although not all of them come under the heading of accounting, they are in entirety reflected in cost accounts. It is, therefore, quite evident that the organization of the Stores Department should be thoroughly efficient and well equipped. The purchase of materials will entail the provision of a suitable place for their storage. Sometimes in a small business very

little heed is given to this important matter, and perhaps a disused shed or some corner of the works is all that is considered necessary, the turnover in stock being so small. A junior is placed in charge and it is considered unnecessary to employ a more responsible assistant, or to adopt a better system. This is not, however, the case in reasonably large businesses, where the stores may run into many thousands of pounds sterling per annum. Considering that each item of stock is represented by its equivalent amount of cash, the necessity for a properly constructed and organized stores is of paramount importance. Another important point not to be overlooked is the services of a thoroughly capable storekeeper. The operations of storekeeping begin with the receipt of goods or materials, and the status of the storekeeper may be likened to that of a cashier. He is responsible for the whole of the goods delivered to him, and this responsibility continues until he has issued them against authorized delivery notes or vouchers. It will be observed, therefore, that his duties will commence with a careful record of what he receives, and he must also be convinced that what he actually receives coincides in every detail with what he is supposed to receive. All goods should conform with orders. The storekeeper must necessarily be experienced and should have supreme control of his department. He should be held responsible for the whole of stock involved.

In the organization of a stores, provided it is to be efficient, due consideration must be given to the fact that all items of materials represent money, and that the records kept should "balance" in a similar manner to "cash." It should not, however, be assumed that by balancing stock means accounting in detail for the last pound of material in the stores; this is sometimes impossible, for allowances of some kind may have to be provided for such contingencies as shrinkage, waste, deterioration of certain materials, etc.

The location and size of the stores will vary, according to requirements, being governed by the class of business carried on and the nature of materials concerned. The stores should be of a commodious structure, and large enough to meet all requirements. In the case of a new factory the position of the stores will present no difficulty. If, however, the position of the stores has to be considered in an existing building which will not lend itself to alteration, a compromise must usually be effected between the question of suitability and accessibility. The position of a stores in a small business will not need much

consideration, as the receipt and issue of materials will be small in quantity and number. Such is not the case with a large factory, where materials in large volume may have to be handled daily. The position must be carefully planned and considered in consultation with the Production and Receiving Departments. It is essential that every facility be provided for the handling of goods when received and placed into stock, also when issued from the stores to the various manufacturing departments. Heavy and bulky stock should be stored as near as possible to the production line or manufacturing department using such materials, so that when these goods are issued from the stores a minimum amount of labour, time, and handling is necessary.

Furthermore, another matter which must be taken into consideration, in deciding the position and layout of a stores, is the greatest distance any one of the manufacturing departments will be away from the stores. In order to eliminate the waste of time and labour in issuing materials to the various production departments in a large works, it is advisable to have separate or subsidiary stores located in convenient places within such production departments. If this practice is carried out the chief storekeeper will still receive all materials, as delivered, and issue to the branch stores only those particular goods that will be required in any production department to which the branch store is associated. For instance, in a tin-canister manufacturing business, tin plates would be stocked in the Tin Plate Printing Department, cardboard for cardboard box-making would be stored in the Card Box Making Department, etc. The above portrays but one example concerning the difficulty of stores control. In some instances it may often be desirable that separate stores be provided for the different classes of materials to facilitate their storage and handling. In most engineering works brass and copper sheets, rods, screws, nuts and bolts, etc., are kept separate from iron and steel castings, and goods that are only partially complete are stored separately whilst they are waiting completion or assembly.

Such a stores may be known as a part finished stores, or component stores. Again, completely manufactured goods being ready for resale are also stored separately.

The storage of the different classes, or types, of materials is often conveniently done in the one store room, simply by dividing the stores into sections and placing such materials in their respective positions. This is usually found to be the

most economical method with most of the medium-sized and smaller factories.

The general layout of the stores will be governed by the class and quantity of materials which it is intended to store. Small items, such as screws, nails, nuts and bolts, etc., should be provided with bins or shelves for their retention, and by judicious arrangement a great deal of materials of the smaller class can be stored in a relatively small space. Such items as iron, brass, and copper tubes or sheets will require upright partitions, in order that the various lengths may be kept separately and tidy according to diameter or size.

The method of storage in bins, etc., cannot be advantageously applied to all trades. Bulky materials will obviously require a totally different method. The class of materials used in a soap or chemical works would be so cumbersome and weighty that there is no better method than to stack them in a suitable shed. Tin plates, sheet lead, iron, etc., in large quantities are generally stored in a shed with a substantial concrete floor. It will be readily seen, therefore, that the general layout and construction of a stores in any class of business will be dependent upon and be determined by the nature of materials used. Further, materials affected by atmospheric conditions would require to be stored in a specially constructed and, perhaps, heated or air-conditioned building.

When deciding upon the capacity of the stores and, in detail, of the bins, shelves, racks or other containers such as vats, barrels, tanks, etc., the normal maximum stocks must first be ascertained. The maximum stock is dependent upon the rate of use of the article, and also of the economical quantity to buy at one time. The rules to be observed in this calculation are simple. Firstly, the average rate of use must be considered, and secondly, how long it takes—taking the longest period, not the average—to obtain the economical quantity. The “minimum stock,” or the quantity below which the stock should never be allowed to fall, is then represented by the quantity (plus a margin for safety) of the article which will meet the normal demands of the factory whilst the “re-order quantity” is being obtained. The “maximum stock” is taken at something above the totals of these two, but it may also be limited by financial consideration.

A stores should always be under the control of one person, who may be known as the storekeeper or stores superintendent.

The responsibilities and duties of a storekeeper may be briefly summarized as follows—

1. To accept only materials or goods into his store when accompanied by a written record stating the quantity and description of the various items, also a note of the purpose for which they are required, and to sign for their receipt from the Receiving Department. (See form of Inwards Goods Note illustrated on page 368.)

2. To keep all items of stock in their correct positions.

3. To keep the stores clean and tidy.

4. To prevent any unauthorized person from entering the stores.

5. To issue materials against a written authority only, which should be properly and correctly made out.

6. To check all requisitions he receives, which have been issued against a bill of material, production order or service order.

7. To check at frequent periods the quantity of goods contained in each bin, or rack, etc., with the quantity stated on the bin card.

8. To watch the stock levels and report—according to the recognized routine of replenishing stock—when the minimum is reached.

STORES RECEIVED BOOK. (See STORES ROUTINE, also GOODS RECEIVED—RECORD OF.)

STORES RECORD. (See STOCK RECORD CARD, also STORES CONTROL ACCOUNTS.)

STORES REQUISITION. A storekeeper should only issue materials against a written authority, and for this purpose there is usually provided a form known as a stores requisition.

A specimen stores requisition is given, from which it will be noted that a full description and quantity or weight of the materials, together with the order number for which they are required, are stated. On receipt of such a form by the storekeeper, he will proceed to hand out the materials and record the issue on his bin card, noting in the space provided the bin number from which the goods were issued.

The issue of all stores must be authorized, and a proper routine laid down whereby particulars of all transactions are recorded. In a well organized factory only certain individuals will be empowered to withdraw materials for use or dispatch, provided they formally authorize the storekeeper to make the necessary issue in accordance with the routine obtaining.

The persons or departments authorized to issue stores requisitions will vary with each concern, as the method of production control as well as the size of the factory will determine the best procedure to be followed in this direction. With the small works, for instance, the foremen of the departments may conveniently be allowed to requisition materials as required, but with large concerns the planning and progressing of work through the factory will entail that the withdrawals of material from stores be properly regulated and co-ordinated.

The illustration shown of the stores requisition conforms to the requirements of the larger concern where production control is exercised through a Planning Department, which issues all stores requisitions that have reference to materials required for all production orders.

When a "bill of material" is used the description of the materials required can be omitted from the requisition, as only the "item number" of the bill of material need be quoted.

The withdrawal of materials, etc., from stores for use on service orders may, however, be made by the foreman of the department, and for this purpose a different coloured form can be used with advantage.

All stores requisitions which have been presented to the storekeeper should be sent to the Cost Department at convenient periods throughout the day in order that the issues from stores can be recorded on the stock record cards.

The procedure of posting all issues on the stock record cards is greatly facilitated by the storekeeper inserting in the space provided on the stores requisition the bin number from which the goods were issued, as by this means the stock record clerk is able to refer at once to the identical card. Furthermore, the possibility of posting issues to the wrong card is almost eliminated.

STORES ROUTINE. The internal routine of a stores will chiefly consist of receiving and issuing of materials, as the bulk of the work performed by the storekeeper and his assistants will invariably be composed of such activities. The various other matters that should be dealt with, however, may sometimes be regarded as subsidiary to them, and consequently of lesser importance. A greater error of judgment cannot be made, as the responsibilities of a storekeeper are comparable with those of a cashier. He is responsible for the whole of the materials delivered to him and during the period they remain in his possession. If consideration is,

therefore, given to the fact that all items of material represent money, the significance of his position should be quite apparent.

The problem of stores routine is simply one of "control and check," and should be applied on very much the same principle to that generally adopted for the Cashier's Department excepting, of course, that common sense must be allowed to decide the "limits" for balancing purposes. For instance, the receipts and payments of cash are expected to balance to the last penny, but in the case of materials this is obviously impossible for a variety of reasons, and a reasonable but safe margin should, therefore, be fixed.

Material control may be said to come under two categories, viz., the control of values as provided by the cost control accounts, and the control and check of quantities, as provided by the stock record cards, both being effected within the Cost Department. In order to obtain a clear conception of what this means, we will analyse the control of materials according to the various phases. Firstly, there is the purchase of materials, and next follows the receipt of the materials (see PURCHASING). From this point there will now be considered the phases of material control in so far as it affects the stores and the form of check exercised in the Cost Department. These may be detailed as follows—

Phase.		Routine Forms Effected.	
		In Stores.	In Cost Department.
1. Receipt and Inspection	Materials delivered to stores (with inwards goods note or other form of goods received record)	Inwards goods note	Inwards goods note
2. Stowing and Recording	Goods placed into their correct position in the stores and the item entered on the bin card and stock record card	Bin card	Stock record card
3. Issue and Recording	Goods issued to Production and Service Departments against stores requisition	Stores requisition, bin cards	Stores requisition and stock record card
4. Credit and Stowing	Return to stores of any surplus materials and issue of stores credit note in exchange	Stores credit note, bin card	Stores credit note and stock record card
5. Replacement of Depleted Stocks	Depleted stocks to be replaced by further quantity	Purchase requisition	Purchase requisition and stock record card
6. Checking	Contents of bins, etc., counted and checked and compared with record on bin cards and stock record cards	Record of bin inspection and bin cards	Record of bin inspection and stock record cards

From the above it will be observed that there are six main phases of material control within the stores with the corresponding check by the Cost Department, and each of these must be covered by any system. The actual details of the system must necessarily differ with the requirements of the factory, and the six phases in so far as they relate to the control exercised by the stores only are, therefore, further dealt with in conjunction with a system for the purpose of explaining the principles involved.

The method of check by the use of stock record cards in the Cost Department is explained under the headings of STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES, also BIN INSPECTION.

1. Receipt and Inspection. Immediately goods are received into store from the receiving clerk or department the storekeeper places the goods into their correct position in the store. The necessary entry, or record, will now be made on a bin card, which should be provided with columns for recording brief particulars of all goods received and issued. The bin card may be ruled similar to Form No. 106.

2. Stowing and Recording. A bin card, as illustrated, may be filed in drawers in order of material or bin number or hung up in a convenient place on the outside of the bin or rack, so that it is available for making entries as and when items are placed into the bin, or taken out and issued to the factory for use on a production or service order. With most firms the various types or classes of materials are scheduled according to their process of manufacture, and given a reference number or symbol. This saves a great deal of time when preparing a list of materials required for the completion of an order, as only the reference number or symbol need be quoted. When such a method is in use, provision must be made for this reference to be stated on the bin card, and in the illustration referred to this is shown immediately below the bin number.

All bins, racks, shelves, etc., should be numbered consecutively in order to indicate to the storekeeper, or his assistants, their location. This number also serves to connect the bin card with the bin to which it belongs.

3. Issue and Recording. It is of the utmost importance that the purchase and delivery of goods to the factory be authorized, and a definite routine laid down which, whilst it places the receipt on record, also notifies the transactions to other departments, such as the cost office, production departments, etc. (See PURCHASING.) In a similar way the

are stored in bulk, such as tar, oils, waxes, etc., this issue will take a different form from that described above. In the case of tar this is usually pumped into large tanks when first delivered, and the quantity to be used for, say, distillation will always be regulated according to some standard formula. A stores requisition may not be used, as the exact quantity required for the process may be drawn from the tank or vat, and the amount used entered on the particular bin card, or other more convenient form of record.

4. Credit and Stowing. Materials issued to the works for manufacture will often consist of items that cannot be conveniently measured into the exact quantity that will be required for the particular operation, process, or batch. For instance, tungsten wire, used in the making of electric lamps, is supplied wound on reels, and owing to its brittle nature must be used with a minimum amount of handling in order to avoid excessive waste, and again enamelled copper wires used for armature winding must also be handled carefully for similar reasons. Under these circumstances it may be the custom to issue to the workers the whole reel of wire, the balance remaining on the completion of any job being returned to the storekeeper, who will then weigh it and issue a stores credit note for the quantity returned.

A similar procedure to that described above will be found necessary in many cases, especially when rod or bar metal is issued, and only a small piece required. It is understood, however, that circumstances will alter cases because it may sometimes be found possible to cut off, or weigh, the exact amount required. In the case of returns to the store of surplus materials, some kind of a form must be provided. This form should be on similar lines to that of the stores requisition, but printed in red, and headed "stores credit note" or "surplus materials returned to stores." When surplus materials are returned to the store, the storekeeper must check the quantity or weight, and place it in its proper bin or rack, recording on the bin card the quantity and the serial number of the credit note or "materials returned to stores note." This credit note is then passed into the Cost Department where the necessary records are made. It is essential that particular attention be given to the procedure of surplus materials returned to the store, for they are dealt with quite differently to materials returned from the production shops as faulty, defective, or as unsuitable for manufacture. Regarding rejected materials, spare parts, etc., a rejection

note will be made out according to routine in the works, the reason for such rejection being stated thereon. These rejected materials will be received into the store in the usual way, but they will not be stowed away with other materials, or entered on the bin card, but placed in a special position to await disposal at the instruction of the buyer.

5. Replacement of Depleted Stocks. By following the above methods it will be seen that the storekeeper has a complete written record of all items in his store, together with a note of all issues to the various manufacturing and service departments. All these records show on the bin cards and by extending into the appropriate column the balance of each item remaining in stock after an issue has taken place, the storekeeper is able to observe when the balance in hand is about to reach the "minimum," and take such steps as may be necessary to replenish his stores. In most works the procedure in regard to general stores items is for the storekeeper to notify the buyer that certain goods have reached the "minimum," and this may be done by making out a purchase requisition as illustrated and described on pages 358 and 359.

6. Checking. Periodical checking of stocks is of utmost importance, and one of the chief duties of the storekeeper is to check frequently the contents of his store in comparison with the records as shown on his bin cards. A very convenient and satisfactory method is for the storekeeper to check a fixed number of items each day, so that at least once in, say, three months a physical check of all items in stock has been carried out.

It is unwise to rely upon the annual stocktaking at the end of a year's trading, for during such a long period it is possible that errors and discrepancies of large dimensions may have been made, and these are not easily rectified at so late a date. The importance of more frequent checkings will, therefore, be thoroughly appreciated. The storekeeper should be provided with suitable means for recording the results of his daily count, and this may conveniently take the form of the record of bin inspection as described on page 23.

It will be noted that such a form serves two purposes: firstly, it provides a log of all bins, racks, shelves, etc., in numerical sequence; and secondly, has suitable columns for recording particulars in regard to each bin as it is checked. Further, a third purpose may be gained, and that is, the storekeeper will be able to tell in which items of stock error

most frequently occurs. The cause can then be investigated and suitable action taken to obviate such errors. The record of bin inspection is passed to the Cost Department, where it is compared with the stock records kept in that office.

Accurate storekeeping is of fundamental importance, and true stocks can only be maintained by sound organization, rigid supervision, and frequent checking.

The actual method or system as affecting material control will differ with each factory, but the preceding remarks should be sufficient to indicate the main phases of this work in the stores proper. The form of check exercised by the Cost Department is explained under the heading of **STORES—FINANCIAL CONTROL AND PERPETUAL INVENTORIES.**

STORES TRANSFER NOTE. In order to eliminate the waste of time and labour in issuing materials to the various producing departments in very large works, it may be advisable to have separate or subsidiary stores located in convenient places within such departments. When this practice is followed, the chief storekeeper receives all materials as delivered, and then issues to the respective branch stores only those goods that will be required in the particular production departments.

The transfer of material from the main stores to a branch store should be properly authorized, and for this purpose a stores transfer note is used. A specimen form is given which is ruled very similar to the stores requisition, but to differentiate it may either be printed in red or upon a coloured paper. A stores transfer note is issued in duplicate and dealt with by the issuing stores in the same manner as an ordinary stores requisition. The receiving stores, however, will enter the item on their bin card as a receipt and then pass the form on to the Cost Department, who will enter it on the stock record cards as a credit to the main stores and a debit to the branch stores.

When a system of stores or material control accounts is in use, the value of the stores transfer notes will be summarized at the end of each month or other period, and the main stores credited with the total value of materials transferred and the various branch or sub-stores accounts debited.

STOWING AND RECORDING. A name applied to the work which is performed by the storekeeper when receiving goods into his stock, and consists of placing the goods into their correct position in the stores and entering the item from his copy of the goods received record on to the bin card. This

phase of a storekeeper's duties immediately follows that of receipt and inspection and precedes that of issuing and recording. (See also STORES ROUTINE.)

STRAIGHT PIECE WORK. (See **PIECE WORK.**)

SUNDRY MATERIALS. (See **EXPENSE MATERIALS**, also **MATERIALS—CLASSIFICATION OF.**)

TAYLOR DIFFERENTIAL PIECE RATE. Under this method the day wage is not guaranteed. There are two piece rates, the lower of which is in operation up to a standard of performance of 100 per cent, up to which point the operator receives approximately 83 per cent of the daily wage rate, or up to .99 per cent production he cannot make the equivalent of his daily rate. The moment, however, he touches 100 per cent output not only does he receive an immediate increment which brings his pay to the equivalent of time and a quarter, but also he is paid at the higher piece rate. The effect of this is to penalize the inefficient worker. To give a large immediate increment on attaining 100 per cent efficiency, and also the higher piece rate offers a very strong incentive to the operator who can make himself efficient.

Its effect on cost per piece produced is very marked on account of the great reduction of indirect (expense oncost) per unit of product.

Doctor Taylor was the first to ignore all records of past experience which concerned either rates of production or the length of time an operation should take. He based his standard times upon accurately made time studies, and as an extra aid to the workman prepared standard instructions showing how the work should be carried out to attain the times set.

It is essential for the success of this method that there should be approved time study practice by qualified observers—detailed instructions to the operators and real co-operation between the Time Study or Rate Setting Department and the workers.

It is interesting to note that Taylor was also the first to make use of a scientific system of paying labour, although Halsey presented the first incentive plan.

TELEGRAMS. (See **TELEPHONE CHARGES.**)

TELEPHONE CHARGES. The rent of telephones and cost of all calls form part of establishment expenses. The rent of telephones can be easily allocated direct to the respective departments. The cost of calls in the case of small firms is usually apportioned arbitrarily according to past experience,

but with large concerns who have a private switchboard, the operator will record all outgoing calls, and in such case the expense in this direction can be allocated direct to the respective departments.

When a concern takes advantage of the facility to transmit telegrams over the telephone, the Telephone Account will contain charges for telegrams, and the item will be apportioned or charged direct in a similar manner as above.

With companies that have installed a private system of internal telephones a standing or service order will be used for ascertaining the cost of maintenance and upkeep, etc., and the total of this account apportioned as above. In some instances, however, the standing order will be subdivided or coded so that the cost of maintenance, etc., is ascertained separately for each department.

TERMINAL COSTING. This is a term that is sometimes used when referring to the method of cost finding employed to ascertain the cost of carrying out a contract, such as the erection of buildings, bridges, or irrigation schemes, etc. This method of costing, however, is similar to the job costing system, and all the various items are charged to a specific order, but in this instance the order will cover the erection of buildings, etc., and not the manufacture of one or a quantity of articles.

In order to explain the detailed working of terminal costing, a brief description of builders' costing is given. (See also COST FINDING, METHODS OF.)

In the building industry, a cost ledger is used to a much greater extent than with other industries, and a general outline of the procedure usually followed in connection therewith, and with the acceptance and execution of contracts, etc., will be useful.

When a contract is agreed, no record should be made in the books of account. The contractee (i.e. the party for whom the work is undertaken) must not be treated as a debtor until work on his account has actually been carried out.

Extras are an important item, and the foreman supervising the contract should issue a separate variation order for each extra agreed upon.

Special clauses included in a contract will also need particular attention, as "Liquidated damages" paid under a "Penalty clause" will, of course, reduce the profit. Alternatively, there may be terms that afford an opportunity to swell the profit by the winning of a bonus granted for

completion within an allotted period. On the other hand, provision may be made that the final payment shall only become due on a date following completion of the contract, and in such cases it is then the practice either to close the account by crediting same and debiting a "Retention Money on Contracts Account," or crediting the Contract Account and debiting the Personal Account of the contractee, thus leaving the items to be shown in the balance sheet as included in "Sundry Debtors" as an asset.

When balancing the financial books, it is not wise to take credit for a gross profit on a contract equivalent to the entire value of the work done to date. In order to provide against contingencies, it is advisable to take credit for, say, two-thirds of the profit, based on the proportion of work completed to date.

Minor jobbing work, such as the repairing of roofs and windows, the unstopping of drains, and cartage, etc., can be posted to a general "Jobbing Account" in the costing ledger. Detailed particulars of the invoice will be recorded in a "Jobbing Day Book," to which reference should be given in the column provided in the ledger.

Labour. The time sheet may be daily or weekly. For small jobbing work, where a record of all work done is required, the daily time sheet may be preferable. Where, on the other hand, the workman need only quote on his sheet the job number against the time spent, the weekly time sheet has the advantage of recording time spent on the several jobs, and also may be so ruled as to serve as an analysis and summary of the wages paid to each man.

The total wages thus analysed on each sheet should be entered at the end of each week on to the pay roll or wages abstract, which in the building trades is generally ruled as shown on page 443.

The total amount of wages for the week will be posted to the credit side of the cash book, and the total of the weekly summary in the pay roll or wages abstract should agree with the cash book entry. The amount dissected should be the gross figure, i.e. including the employer's contribution to the National Insurances, together with any bonuses that may have been earned by the workmen. The analysis and summary in the wages abstract may cover not only current contracts and jobs, but also job numbers for other wages expenditure, such as repairs and renewals to plant.

Materials. The first stage in the analysis of expenditure

Week ending 6/19

[illegible]

on materials for the various jobs in hand should be effected by means of an analysed form of purchase day book, as by this means all purchases can be analysed into, say, four sections, i.e. (1) purchases direct to jobs; (2) purchases for general stores; (3) plant and tools (capital); (4) plant and tools (repairs and renewals).

Sections 1, 3, and 4 are self-explanatory, but in regard to (2) purchases for stores, these items will need to be further analysed, in order to ascertain the value consumed on each contract. This will be effected by using a system of stores requisitions in a similar manner to that described under the headings "Stores Requisitions," "Stores—Financial Control and Perpetual Inventories," etc.

Direct Charges. Such items as travelling expenses, accommodation, and similar allowances for men away on jobs, as also the carriage on plant, etc., will be collected periodically from the financial and cost books, and charged to the respective contracts in just the same way as direct charges are dealt with in job costing.

Establishment Expenses. In the case of an ordinary building contract, such indirect expenses as rent of any land or buildings occupied for the purposes connected with the execution of a specific job, clerks and timekeepers employed at the works, depreciation of plant and machinery, and the provision of such general essential services as power, lighting, heating, etc., which are incurred on the job, present little difficulty, for expenditure of this character is clearly identified with the contract, and will, therefore, be charged to the cost account similarly to the ordinary items of direct charges, excepting that these amounts should be kept quite distinct from the more "direct" expenses.

The building contractor, however, may have a central "works," with stores and all other necessary materials relating to such works. There may also be technical men passing from one contract to another, and the establishment expenses will thus have to be apportioned to the various jobs. This may be effected by using either the direct labour or direct labour hour basis; the latter generally gives the better results. However, for a detailed consideration of this particular subject, see COMPUTATION AND RECOVERY OF EXPENSES.

TERMINOLOGY. (See Cost.)

TIME BOOK. Many years ago it was sometimes the practice to record the arrival and departure of workers by

entering their names in a Time Book. The actual method of writing up this record varied in almost every case. With the very small concerns the Time Book would be placed in some convenient position at the entrance to the factory, so that each worker could sign his name therein when entering and leaving every morning and midday, etc., but with the larger firms it was found necessary slightly to modify the method on account of the considerable delays caused by the time taken when signing the book.

The time clerk or gatekeeper would, therefore, stand at the entrance to the factory and note the names and time of each worker when entering the premises at mornings and midday, etc. In some instances it was the practice for the time clerk to go round each department during the mornings and afternoons and enter the names of each worker, and so compile the register of attendance in this manner. It will readily be seen that any of the above methods are most unsatisfactory, as disputes in regard to errors of booking time can never be settled to the satisfaction of employer or employee.

The Time Book method is now only used in exceptional cases, such as an "owner-manager" business and where a few men are employed.

TIME CARD. (See CLOCK CARDS.)

TIME DOCKET. A term that is sometimes used and may refer to a "time sheet" or "clock card," which see.

TIME RATE (also known as **Day Work, Day Wage, Time Work, Day Rate**). This method of remuneration resolves itself into a bargain between the employer and the worker, that in exchange for a stated sum of money paid by the former, the latter will attend the employer's works for a fixed number of hours per day or week, and be amenable to such rules and regulations as the employer may enact. There is no bargain that the worker shall do any specified quantity of work in return for such payment, in fact he may frequently not be working at all; in practice this actually does occur, yet on the official pay day he is entitled to receive the amount of money bargained for, subject to deductions for being late or absent.

There are innumerable objections to this method. As men varying in ability are given an equal wage, its principle is both unsound and unfair. The highly skilled worker, capable of producing work which in quantity and quality is far above the average, receives no higher pay than he who is slipshod

in his methods and an ignoramus at his work. It is a characteristic of time work that output relatively is small, and this leads directly to excessive labour cost and, where expense is calculated as a percentage on labour cost, to an excessive overall cost.

It is also very costly, because under it workers are afraid to establish fast times, being apprehensive that the quickest recorded time might conceivably be used at some future date to establish a low piece rate should a change in the method of payment be decided upon. It is also considered that an excessive amount of supervision and "driving" is required in order to obtain any approach to what is considered a reasonable amount of work. Inasmuch as the payment is for an indefinite amount of work, it is consequently almost impossible for an employer to arrive at a figure which will enable him intelligently to tender for contracts.

This method is of almost universal application and (except for indirect workers whose work is of such a nature that it is difficult—though not always impossible—to pay them by any other method) the only excuses for its continuance are custom and its ease of computation. The variants of the time rate, involving payments of premiums or bonuses, will be found described under their various titles. (See also WAGE INCENTIVE.)

TIME RECORDERS. The method of checking men in and out of the factory by the use of metal checks has been almost superseded by the more reliable method of mechanical time recorders. The chief advantages derived by the use of time recorders may be summarized as follows—

1. They prevent disputes in regard to time as a worker can see for himself the time that he has registered.
2. They enable a correct allocation of the times spent on various jobs or processes to be obtained.
3. They allow the system of time booking to be easily modified or amplified to meet changing conditions, as they can be readily installed in any part of the factory.

It is essential that all time recorders register the correct local times, and many firms who use a number of clocks find it an advantage to have them synchronized.

The actual position in which the time recorders will be placed in any factory will vary to a considerable extent, but when separate recorders are used for the purpose of booking the attendance of workers at the factory and for booking time to jobs, etc., it is preferable that the one set of clocks

be located at the entrance and the others placed in a convenient position inside the factory.

When the same clocks are used for both purposes, they may be installed in the various departments, and in such cases a few minutes should be allowed the workers in passing from the gate to the clocks for registering, but if separate clocks are placed at the gates it is usual that a method of supervising the men during the process of clocking "in" and "out" be instituted. There are two general methods of doing this. The first is to have locks affixed to each clock and the gatekeeper to open the recorders for use at stated times, and then to lock them up a few minutes after starting times; alternatively, locks are fitted to the card racks, which are locked between starting and finishing times to prevent their unauthorized use. In both cases, however, the gatekeeper or other official should be present whilst the clocks are being used.

The cards used by the men at the gates are essentially the record of attendance, from which all time wages are calculated. Many terms are used when referring to these cards, such as clock card, time card, time ticket, etc., but it is considered that the term "gate card" is the more correct.

Mechanical time recorders can be classified according to types as follows—

1. Card machines—Platform type.
2. Card machines—Clipper type.
3. Non-card machines—Autograph or Signature.
4. Side Printing machines.
5. Radial machines (sheet machines).
6. Key or Bundy machines.

TYPE 1. CARD MACHINES—PLATFORM MODEL. With this type of machine, the vertical location of the record is controlled by the platform in the machine, all registrations at a given time being in the same relative vertical position.

The horizontal position of the record is controlled—

- (a) by manual operation of the shift lever,
- (b) by an automatic device in the Recorder set to operate at predetermined times.

Fig. 22 is an illustration of this type of recorder together with IN and OUT card racks as used for registering a worker's time upon entering and leaving the factory. The style of printed record is also shown in Form No. 110, where the times are printed horizontally across the card, and Form No. 111 with times printed in vertical columns.

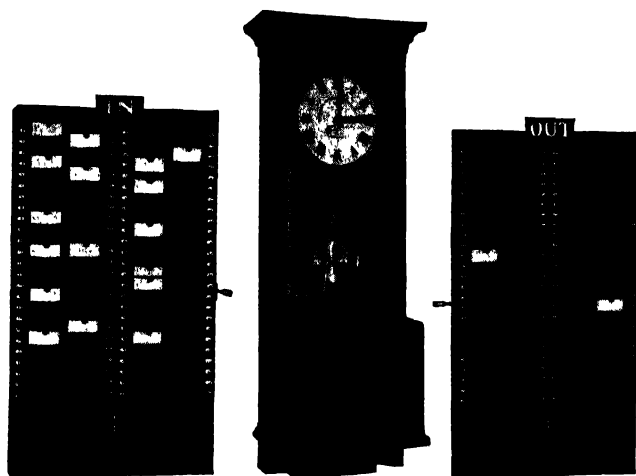


FIG. 22. THE PLATFORM MODEL OF CARD TIME RECORDER

PAY CHECK		Week Ended 9:4:49						
321 GLEDHILL-BROOK								
Received Pay _____								
Week ended 9:4:49								
321 GLEDHILL-BROOK								
DAY	A.M.		P.M.		OVERTIME		O.TIME	
	IN	OUT	IN	OUT	IN	OUT	REG	EXTRA
Su								
M.	7:30M	12:00M	12:42 P	5:00 P				
Tu	7:30M	12:00M	12:42 P	5:00 P				
W	7:30W	12:00W	12:42 P	5:00 P	5:30 P	7:30 P	2:0	1/2
Th	7:30Th	12:00Th	12:42 P	5:00 P				
F.	7:30 F	12:00 F	12:42 P	5:00 P				
Sa.	/	/	/	/				
					Rate		£	s
STANDARD					44-0			
OVERTIME					A-0			
EXTRA					1/2			
LOST					-			
					46 1/2		3/-	6 19 6
No. Rec					Invoice No			
SUBJECT 46/11					5/1		10 0	
NETT PAY							£ 6 9 6	

Form No. 110. TYPE OF CARD USED ON RECORDERS PRINTING HORIZONTALLY

No 205						
Name B. GLEDHILL BROOK						
Week ending 28 APRIL 1949						
DAY	IN	OUT	IN	OUT	TOTAL	
A.M. Sa P.M.						
A.M. Su P.M.						
A.M. M P.M.	7:30 M	12:00 M	12:42 P	5:00 P	£ 48	
A.M. Tu P.M.	7:30 Tu	12:00 Tu	12:42 P	5:00 P	£ 48	
A.M. W P.M.	7:30 W	12:00 W	12:42 P	5:00 P	£ 48	
A.M. Th P.M.	7:30 Th	12:00 Th	12:42 P	5:00 P	£ 48	
A.M. F P.M.	7:30 F	12:00 F	12:42 P	5:00 P	£ 48	
Hours		Rate		£ s d		
Ordinary Time		44		3/- 6 19 0		
Overtime						
TOTAL				6 12 0		

Form No. 111. STYLE OF PRINTING BY CARD TIME RECORDER

TYPE 2. CARD MACHINES—CLIPPER MODELS. With this type of machine the vertical location of the record is controlled by the clock card, a piece is cut from the side of the card (about $\frac{3}{16}$ in. wide) at each registration, thus allowing the

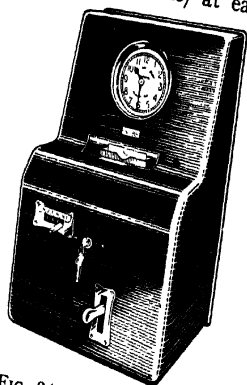


FIG. 24. CARD MACHINE-
CLIPPER MODEL

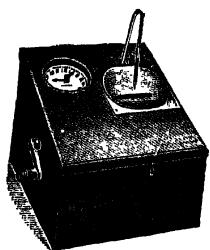


FIG. 26. NON-CARD TIME
RECORDER (AUTOGRAPH
OR SIGNATURE) DESK OR
PORTABLE TYPE

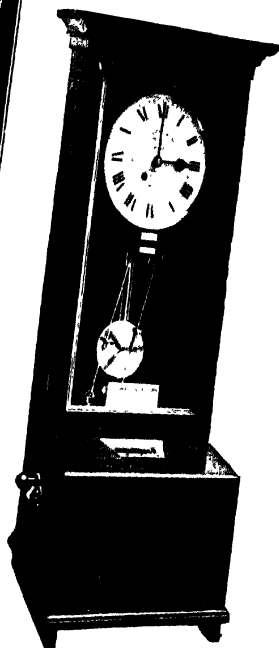


FIG. 25. NON-CARD TIME
RECORDER (AUTOGRAPH OR
SIGNATURE) WALL TYPE

card to fall one cut below the previous one, either in the same vertical column or otherwise. Clipper recorders are available with automatic shift to card sheath or with manual operation for changing columns. An illustration of this type of machine is given in Fig. 24 and of the cards to show the method of printing. Form No. 112 is a gate card and Fig. 23 shows the booking of time to service orders.

TYPE 3. NON-CARD MACHINES (AUTOGRAPH OR SIGNATURE). These machines are sometimes referred to as "Tape Machines" since the record is made on an endless paper tape on which

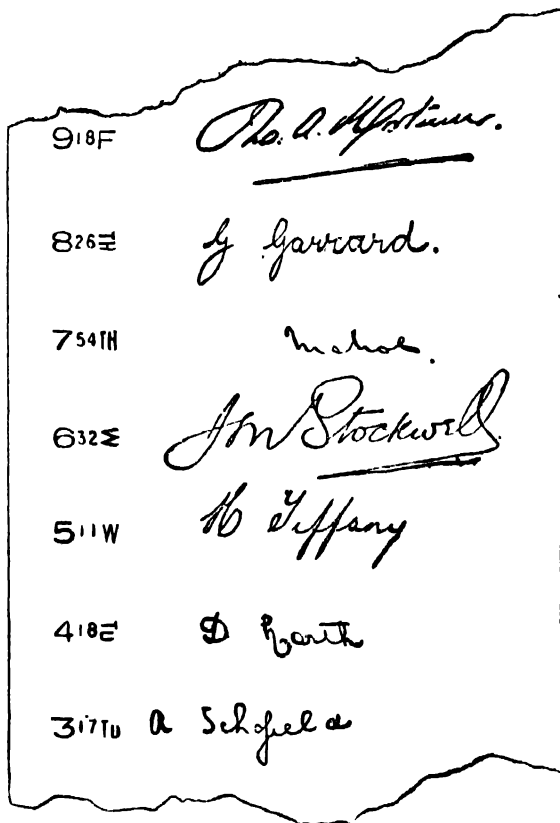


FIG. 27. ILLUSTRATION OF SIGNATURE RECORD MADE ON NON-CARD TYPE OF TIME RECORDER

workers (usually clerical staff) sign their names against the times of arrival and departure, automatically printed by the Recorder against the signature. Fig. 25 shows the wall type of machine, and Fig. 26 the desk or portable type. An illustration of the signature record is also shown in Fig. 27.

TYPE 4. SIDE PRINTING MACHINES. These machines do not

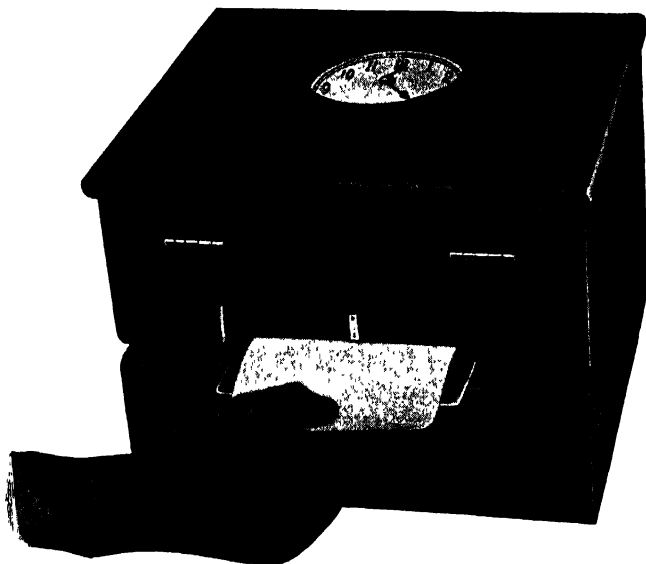


FIG. 28. SIDE PRINTING TIME RECORDER

No 72		Name Gledhill Brook		
Last Time	Open Time	Overtime	Total	
1	8 ³⁵	2 ³⁰	11 ⁰¹	Tu
				IN Tu 7 ⁵⁵
				OUT Tu 12 ³⁰
				IN Tu 1 ³⁰
				OUT Tu 5 ³¹
				IN Tu 6 ⁰⁰
				OUT Tu 8 ³⁰
	8 ³⁵		8 ³⁵	W
				IN W 7 ⁵⁵
				OUT W 12 ³⁰
				IN W 1 ²⁹
				OUT W 5 ³⁵
				IN
				OUT
	8 ³⁵		10 ³⁴	Th
				IN Th 7 ⁵⁴
				OUT Th 12 ³⁰
				IN Th 1 ³¹
				OUT Th 5 ³⁰
				IN Th 6 ⁰⁰
				OUT Th 8 ⁰⁰

Form No. 113. SHOWING STYLE OF PRINTING MADE ON A
SIDE PRINTING TIME RECORDER

employ a mouthpiece of fixed size as in card machines, although they will record on cards or paper of nearly any size. Both ends of the slot into which the card or paper is placed horizontally are open, therefore a card of any size can be inserted. The location of the printed time record is determined by the operator placing the card or sheet under a locating spot and

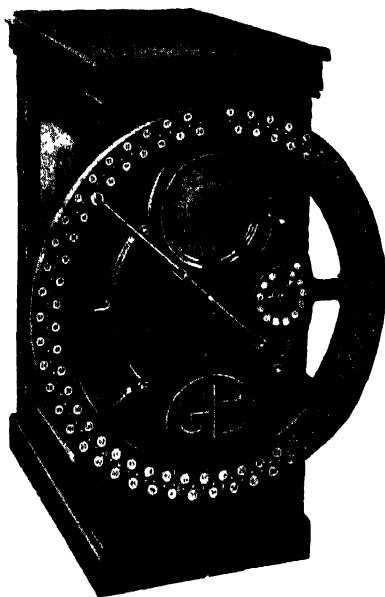


FIG. 29. ILLUSTRATING RADIAL (SHEET) TIME RECORDING MACHINE

holding it there whilst recording the time. Fig. 28 is an illustration of this type of machine and the style of printing is shown on the card, Form No. 113.

TYPE 5. RADIAL (SHEET) MACHINES. With this type of Recorder (illustrated in Fig. 29) a ruled sheet of paper accommodating from 20 to 200 workers (according to size of machine) is wound round a rubber-faced drum inside the machine.

A rotating arm is moved by the operator to the hole opposite to his or her clock number and depressed into the hole which locates the line on the sheet corresponding to the worker's name and prints the time thereon.

These machines are available with automatic shift to the carriage so that the drum housing the paper record is moved to the correct IN and OUT positions at predetermined times. New installations of radial recorders are now seldom made in

No	MONDAY				TUESDAY			
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1	800	1232	131	528	757	1230	129	531
2	757	1232	130	531	801	1228	128	529
3	759	1231	128	530	756	1231	132	530
4	759	1234	128	530	759	1232	130	534
5	800	1234	132	529	800	1233	129	531
6	802	1229	129	531	756	1232	128	532
7	757	1230	125	530	802	1231	132	529
8	755	1230	129	530	757	1234	130	530
9	803	1231	130	528	759	1229	129	532
10	756	1232	127	531	800	1230	130	531
11	759	1234	127	530	757	1238	129	532
12	800	1232	131	529	801	1234	128	534
13	801	1228	128	530	805	1232	132	530
14	756	1231	124	531	759	1230	130	531
15	800	1231	130	530	800	1229	129	529
16	752	1231	128	528	757	1232	128	530
17	757	1229	117	531	759	1234	132	532
18	802	1233	127	530	757	1232	137	534
19	758	1232	130	530	800	1229	129	530
20	755	1230	131	531	803	1232	130	529

FIG. 30. SHOWING STYLE OF PRINTING ON RADIAL TIME RECORDING MACHINE

factories, their use being usually limited to clerical and other workers not paid by reference to time.

An illustration of the style of printing obtained with a radial line recording machine is given in Fig. 30. The ruled sheet, in this instance, provides accommodation for a maximum of twenty workers.

TYPE 6. KEY OR BUNDY MACHINES. These machines are of the tape class but unlike the autograph type which use a signature, the recording mechanism is operated by a numbered key.

Each worker is provided with a metal key on which is

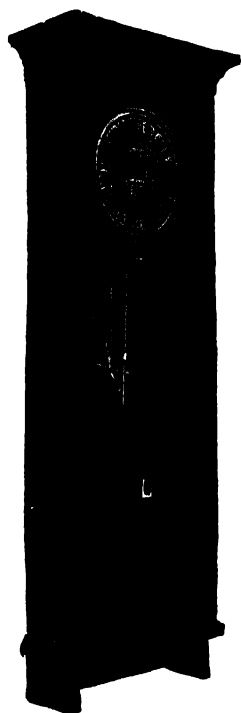


FIG. 31. ILLUSTRATION OF KEY OR BUNDY MACHINE

7 53	434
7 54	358
7 55	466
7 58	390
8 02	480
* <u>12</u> 30	462
* <u>12</u> 31	541
* <u>12</u> 31	480
* <u>12</u> 31	466
* <u>12</u> 31	358
<u>1</u> 29	67
<u>1</u> 29	358
<u>1</u> 30	462
<u>1</u> 31	541
<u>1</u> 32	466

FIG. 32. EXAMPLE OF PRINTING BY THE KEY BUNDY TIME RECORDING MACHINES

engraved his identification number. On arrival and departure the worker takes his key from the IN rack, places it in the key hole of the machine and turns it until the bell rings and a record is made on the travelling paper tape inside the machine, the clock automatically prints the time opposite to the clock number.

The key machine is illustrated in Fig. 31 (above) and the style of printing in Fig. 32.

These machines are not now considered suitable for attendance time recording in factories, as the sequence of the records is that of the arrival and departure of the individuals and it is necessary to analyse the tape record and collate each worker's time.

Methods of Driving the Mechanisms. There are three generally accepted methods of obtaining and utilizing power to operate the mechanisms of time-recording machines

1. (a) Spring drive, with fusee compensation to equate the unequal tension of the spring.

(b) Spring drive direct without fusee compensating device. Both of the above methods follow general clock practice and require winding weekly.

2. Electric impulse from a master clock based on batteries automatically charged from the mains. With this system the master clock sends out an electrical impulse each half-minute or minute; this impulse operates the magnets in the time recorders and propels the time-recording mechanism and the fingers on the time dials. All recorders in the circuit will show the same time and thus unification of records is available. The recorders do not require winding.

3. Synchronous motor-driven recorders. These are driven direct from the A.C. mains by a small motor incorporated in the mechanism and depend on the controlled frequency of the current for their time-keeping.

Uses of Time-recorder Machines. Time-recording machines are used primarily for the following purposes—

(a) Attendance time recording, to register and collate times of entry and departure from the premises for time and wage calculation.

(b) Job and process costs, whereby the starting and finishing times are recorded.

(c) Many other ancillary purposes such as—

1. Bus and tram control of journeys.

2. Garages for car housing.

3. Billiard rooms, for table time charges.

4. Watchman's journeys.

5. All other purposes where records of time are required.

Time-recording machines with special card sheaths are available for use with tabulating machines, so that the tabulator card can be clock recorded in the time recorder and subsequently punched and used in the tabulator.

For a description of the routine in connection with the

recording of time on "gate cards," see under that heading. (See also **TIME RECORDING**.)

TIME RECORDING. Labour is a fundamental element of cost, and its treatment both in regard to the remuneration of workers and the allocation of labour costs to jobs and processes, etc., will require careful consideration.

The recording of a worker's time will generally fall under two headings—

1. Record of attendance at the factory.
2. Record of the time spent by workers upon each task or factory order.

The record of time spent in the factory, which forms the primary basis of calculating the worker's pay each week, must be made quite separately from that of the time spent on each task or order, as in practically all industries it is a trade union rule that each worker shall be guaranteed a minimum rate of pay per hour or per week, irrespective of the quantity of work done.

This distinction between the time records is also necessary when a bonus or reward is paid as an inducement for increased effort, and also for the purpose of analysing time to individual jobs or processes.

Male and female labour will usually require different treatment in the costing and pay roll records, as different rates of pay operate according to age, degree of skill attained, and the nature of the work performed.

The actual method that will be used for recording time will depend upon the number of workers employed, the nature of the work performed, and the method by which they are rewarded for extra production.

1. Recording Attendance at the Factory. There are a number of ways of recording the time a worker enters and leaves the factory, but all of them may be classified into three groups—

- (a) Written records.
- (b) Metal checks.
- (c) Mechanically printed records.

(a) A written record of the arrival and departure of workers—a legacy of the antiquated methods of factory management of years ago—was perhaps the first method used and, owing to the many disputes that invariably arose through inaccuracies and differences, etc., the method has been modified and amplified in several ways. The methods

now used may be classified under the following headings, and a full description of each will be found under the respective titles.

Time Book, which is used in three ways—

(1) The book is signed by each worker when entering and leaving the factory premises.

(2) The times of each worker are entered by the time clerk or gatekeeper who stands at the entrance of the factory.

(3) The time clerk goes around the works at a fixed time each morning and afternoon and notes the names of each worker.

With the very small factory any of the above methods may be used, but in cases where a dozen or more workers are employed, they will be found most unsatisfactory and unreliable, as a considerable amount of friction and arguments are caused when times are disputed. (See also *TIME BOOK*.)

(b) *METAL CHECKS*. In order to overcome some of the weakness attached to the use of time books, there has been introduced a system whereby each worker is provided with a brass check on which is stamped his "check" number. The checks are hung on boards in numerical sequence and placed at the entrance to the factory. As each worker enters, he lifts his check from the board and drops it into a box and proceeds to his work. After all employees have passed into the works, the box containing the checks is removed by the gatekeeper and the numbers on each check entered in the *Time Book*. The checks remaining on the board are also listed, and the list, together with the *Time Book*, sent to the Wages Department as notification of absentees.

This method is just as unreliable as time books. Disputes will arise in many instances, which can rarely be settled to the workmen's satisfaction, owing to the absence of a reliable written record. It is not uncommon also for a workman to "lift" his absent friend's check from the board and drop it into the box with his own, thus registering the attendance of absentees. (See also *METAL CHECKS*.)

(c) *MECHANICALLY PRINTED RECORDS*. A mechanically printed record is necessary if absolute accuracy is desired. A mechanical time recorder will prevent disputes and establish confidence as an employee can see each registration when made.

With these methods the times are registered either upon cards, a separate card being provided each worker, or on

sheets containing spaces for a number of workers. Automatic time recorders are, therefore, classified into two groups—

(1) Time recorders—Card system.

(2) Miscellaneous time recorders.

(1) *Card Time Recorders.* These machines give a weekly tabulated card record of every employee, printing the day, hour, and minute. A time recorder is placed at the entrance to the factory, and on either side are fixed two card racks for holding the cards in numerical order. On entering the employee takes his card from the "out" rack, places it in the clock, registers his time, and then puts it in the "in" rack. When leaving the above process is repeated.

The cards used by the men at the gates, and known as "gate cards," are essentially the record of attendance, and from which all time wages are calculated. Many other terms may be used when referring to this card, such as clock card, time card, time ticket, wages card, etc., but none of these correctly describe the particular form. (See also TIME RECORDERS, GATE CARDS, and BOOKING TIME TO JOBS—METHODS OF.)

(2) *Miscellaneous Time Recorders.* With miscellaneous recorders the registration of the time is made on a sheet or tape and the various kinds of recorders available chiefly differ in the mode of registering. The key time recorders, for example, make use of numbered keys, which are hung on boards similar to the metal check method, one board being for "in" and the other for "out." To register, each employee takes his numbered key and inserts it in a keyhole in the recorder. A printed impression is thus made on a paper tape inside the recorder of the hour, minute, and the distinctive number of each employee. The records thus appear in chronological order, so that the records of late arrivals are automatically grouped together.

With another kind of time recorder, the time is recorded upon sheets which are ruled to accommodate employees in groups of 50, 100, or 150. With this type of recorder, the registration is made by means of a pointer-arm, which is swung round until it is over a hole in line with the worker's "clock" number, and pressing the pointer into the hole.

Recorders of the autograph type are sometimes used, but their employment is more suitable for recording the times of the works and office staff, etc.

A description of the various types of mechanical Time Recorders will be found under the heading of TIME RECORDERS.

2. Recording Time Spent by Workers upon Each Task or Factory Order. The actual method of recording the time each worker spends on individual orders or operations, etc., will depend upon the system of wage payment in use and the nature of the work performed. The records in this direction may be classified into two groups—

- (1) Recording time spent on production orders.
- (2) Recording time spent on service orders.

In these instances, where the same method can be adopted for (1) and (2) above, it is desirable that different coloured forms be used to differentiate between the two classes of work, but when this is not possible two or more methods may be necessary.

The variety of methods that are available for either group may for the purpose of consideration be classified into—

- (a) Written records.
- (b) Printed records.

Recording Time Spent on Production Orders. (a) **WRITTEN RECORDS.** When a worker's time is allocated by means of written records, there will generally be used a time sheet on which is inserted the commencing and finishing times for each task, and the use of such a method is only desirable when it is found to be impracticable for direct workers to record their time by means of automatic time recorders. In many instances this is the only method that can be used with advantage, owing to the special nature of the work. In a certain chemical mixing process, for instance, a direct worker will be in charge of several mixers and his time cannot, therefore, be definitely allocated from hour to hour to each mixer, but only apportioned at the end of each day. The use of a time sheet in such a case is the only satisfactory means available. (See also **TIME SHEET**.)

(b) **PRINTED RECORDS.** Automatic time recorders enable a worker's time to be definitely allocated to each task with a greater degree of accuracy than is the case with written records if the system is connected or "tied in" with a method of inspection and viewing. There can be no standard system of booking time to jobs by means of time recorders, as the special conditions of each factory will necessitate a routine being devised accordingly, but whatever method is adopted there will be used a clock card, known as a job card, on which the times will be printed. (See also **BOOKING TIME TO JOBS**.)

Recording Time on Service Orders. In practically all industries there are varying kinds of service which have to be rendered the producing departments, such as attending to simple breakdowns of machine tools and plant, replacing broken belts, repairing of leaks in water pipes, or making small alterations to the lighting system, etc., and in cases where there may be only one or perhaps a few men engaged upon this class of work, it is not practicable for them to book their time by means of automatic time recorders, owing to the short periods they are engaged upon each of these sundry jobs ; for instance, the sundry jobs performed by millwrights will not only vary from, say, a quarter of an hour to one hour each, but the work may be done in several departments, and as the workmen may not be continuously engaged on such work, the allocation of their time is more conveniently effected by the use of time sheets in preference to clock cards. With large factories, however, it is often possible definitely to allocate each worker to a specific job owing to the large number of men employed on this class of work, and in such cases their time could then be analysed by using clock cards.

TIME SHEET. A form used by employees to record thereon the amount of time which they have spent upon individual jobs or services during the day, week, or other period.

Time sheets are only used in those cases where it is found to be inexpedient or impracticable for the workers to allocate their time by means of automatic time recorders.

The utility of such a form may be considered under the following headings—

1. **Indirect Labour.** The considerations referred to above, under the head of **RECORDING TIME ON SERVICE ORDERS**, will here apply.

2. **Direct Labour.** In some industries the nature of the work to be performed is such that time sheets are used by the direct workers when it is not possible to allocate their time by means of mechanical time recorders. In the manufacture of paint, for instance, a direct worker may be engaged in the Milling and Grinding Department, and as he will usually be in charge of several mills, his time cannot be definitely allocated from hour to hour to each mill, but only apportioned at the end of each day. A time sheet in such a case is the only satisfactory means available.

A specimen time sheet is given on page 462. It will be noted

TIME SHEET

[illegible]

Size of Form 10" by 8".

that there is entered in the columns provided the order number and particulars of the work performed or service rendered, also the time of commencing and finishing each day. At the end of each day or week the time sheets are passed on to the wages section of the Cost Department, and the total time shown thereon compared with the times stated upon the gate card, and any differences investigated.

When time sheets are used to any great extent, it is often very difficult to ensure that all workers enter up their time each day, the tendency being for the sheets to be written up on the last day of the week. In order to avoid this difficulty, time sheets which are ruled to accommodate the times for one day only should be used so that the workers can hand them in to the time office on leaving the premises at night, new time sheets being handed out to the men the next morning upon entering the factory.

TIME SLIP. (See TIME SHEET.)

TIME STUDY. The determination of an equitable allowance in time or price for the performance of an operation or a cycle of operations.

This consists of splitting the operation into its basic elements and finding the time for each element. For example, suppose the work to be done is a planing operation, the following elements would be timed—

Time to lift work from floor and place on planer table.

Time to level and set work true on table.

Time to put on stops and bolts.

Time to rough cut $\frac{1}{8}$ in. thick, 24 in. long, 4 in. wide.

Time to finish cut $\frac{1}{16}$ in. thick, 24 in. long, 4 in. wide.

Time to remove stops and bolts.

Time to remove work to floor.

Time to clean machine.

It is evident that all classes of work can be reduced to elementary operations, each of which can be readily timed. In the course of time a valuable amount of information will be compiled, such as machining elements in speeds and feeds, etc., and material removal standardized and tables compiled. Comparison of observed elements to those accepted standards will maintain consistency and tend to minimize errors due to human elements.

Allowances are made for fatigue, unavoidable delays, and tool sharpening, etc. In many cases a flat percentage is added for contingencies.

Needless to say, time study of this description can be

[illegible][illegible]

[illegible]

carried out successfully only with the co-operation of the worker. The observer, of necessity, must be fully trained, tactful, and fully appreciative of human relations.

A specimen time study or observation sheet (Form No. 115) is shown to give a general idea of the type of form used in this work. The front of the form contains a full description of the work to be performed and columns provided, numbered 1 to 10, in which the several times are entered for each element. The average is then determined after eliminating exceptions. On the back of the form is contained instructions to the worker covering operations to be performed, tooling, etc.

The subject of Time Study is too large to be dealt with in dictionary form, and the student should consult a text for the details and applications of time study. (See RATE SETTING, MOTION STUDY, JOB EVALUATION, and WAGE INCENTIVE.)

TIME TICKET. (See CLOCK CARD and TIME SHEET.)

TIME WORK. (See TIME RATE.)

TOOLS—DEPRECIATION OF. The amount of depreciation of small tools, both perishable and permanent, is a charge to factory expenses.

With small perishable tools, such as hammers, files, screw-drivers, drills, etc., the amount of depreciation may be ascertained in several ways ; for instance, the total purchases made may be charged to an account, and at the end of the period the stocks remaining are valued and the difference "written off" as depreciation. With this method the small tools issued to the producing departments, and still in use at the time of stocktaking, are valued and included in the total. Another method is to regard all issues from the tool stores as replacements of the original equipment, and to charge the amount to revenue as depreciation.

With such a method it is necessary that an inventory be made at the end of a financial period of all tools in use, which are priced at, say, two-thirds their value. The total of this inventory represents the capital value of the asset, and future issues of tools are charged out as stated above.

When the amount of depreciation has to be allocated to the various producing departments, this is usually effected by means of a system of service orders.

TOTAL COST. Sum of all items of expenditure *incurred* to produce, manufacture and market any commodity, or to render a service, i.e. the total of factory cost, plus selling, distribution, and administrative expenses.

TRANSFER NOTE. (See **WORKER'S TRANSFER NOTE**, or **STORES TRANSFER NOTE**.)

UNABSORBED EXPENSES. The recovery of expenses in costs does not necessarily imply that all expenses must be recovered in the cost of goods produced, but rather that the working of the costing system should show how and why the expense was incurred. All the unremunerative and unabsorbed expenses must be segregated from those expenses that have been legitimately incurred by actual production.

Unremunerative expenses are items which arise through waste and careless management. Unabsorbed expenses, however, will arise despite the fact that the plant is well and efficiently managed. Machines will break down and unavoidable delays occur, and during the time that productive machinery is temporarily idle for short periods the factory or machine expense that would otherwise have been absorbed by production is segregated and charged to an account "Unabsorbed Expenses."

This class of expense item will usually be covered by a system of service orders and may sometimes be referred to as Idle Time or Unallotted Time, etc., and the system of service orders arranged to show the cause such as—

- Machine Breakdown.
- Waiting for Tools.
- Waiting for Materials.
- Belt Breakdown.
- No Work, etc.

This analysis will naturally depend upon the size of the plant and the nature of the industry, the chief objective being the segregation of all expense items which have not been absorbed by actual production.

The subject of Unabsorbed Expenses will invariably arise when dealing with the recovery of expenses and reference under the heading of "Establishment Expense" should be made for further information on the subject. Unabsorbed Expenses are also an important factor in a system of standard costing or budgetary control and reference to these subjects should also be made. (See also **UNALLOCATED TIME**.)

UNABSORBED FACTORY EXPENSE ACCOUNT. (See **COST CONTROL ACCOUNTS**.)

UNALLOCATED TIME. A term used when referring to the "idle time" or time lost by direct workers in changing over from one job to another or for various other reasons.

In all manufacturing concerns there will always be stoppages and delays due to many causes, some of which are unavoidable; for instance, time may be lost in reporting to the foreman between jobs, in waiting for a fresh order to be issued, waiting for materials, in "washing up," or any other cause which will keep the workers away from their "productive" work. In those industries where the time lost is due to many reasons, a series of service or standing works orders is generally brought into use, so that all unallocated time can be collected and analysed and the cause shown.

The total amount of unallocated time is generally charged to the department's Expense Account. (See SERVICE ORDERS, also BOOKING TIME TO JOBS—METHODS OF (No. 7).)

UNIFORM METHODS OF COSTING. An appreciation of the benefits which accrue to the individual industrial concern leads directors to the idea that, if all the other concerns in their own particular branch of industry could be persuaded to adopt the same system of cost accounting, it would create a situation which would be full of advantages. Indeed, there are those who go farther, and who envisage the adoption of standardized systems for all industries just in the same way that an orthodox form has been agreed upon for the presentation of financial accounts.

The subject of standardization in cost accountancy formed the basis of a discussion held under the auspices of the Institute of Cost and Works Accountants, and a brief survey of the possibility of standardization in cost accountancy, its advantages and its difficulties as placed before that meeting is as follows—

One of the principal advantages of an effective costing system lies in the provision of a means of measurement of actual performance against agreed standards; thus the manufacturer is able to compare the cost of one batch of products, against his estimate, or against another batch produced later, and under different conditions, or is enabled to compare the cost of one process against the cost of another one, involving perhaps greater capital outlay for the production of the same article; he is enabled to set a measure of profit to be earned by each section of his factory, and to compare the actual results with the standard which he has laid down.

It is this function of cost accountancy which possibly makes the idea of standardized systems for one branch of industry so attractive. It would be extremely helpful for

manufacturers at the conferences of their trade associations to be able to think and speak in exactly the same terms when dealing with the cost of production ; a standard could be set up for the industry, and the factory manager who is unable to achieve such standard of performance could be shown exactly in what direction economies could be effected. It would be of very great value indeed in times of trade depression to make use of cost figures for the purpose of agreeing upon price reductions without resorting to cut-throat policies. Price reductions based upon accurate costs would naturally show each manufacturer exactly what problems he had to face, and to what extent it would be necessary for him to finance his business.

Appreciating then these obvious advantages which the standardization of cost accountancy by industries would appear to offer, the difficulties only become apparent when attempt naturally follows to put them into practice. Let it be stated at the outset that the standardization of cost accounts, and of their form for all industries is not practicable, if for no other reason than the divergence of the nature of the products of industry. Thus, we may distinguish between industries which produce in bulk, industries which produce in detail, and industries the measure of whose output is the service rendered. Obviously, the basis of the cost accounts for these three types of industry is so divergent, and requires such different treatment for the examination of results, that uniformity becomes a matter of supreme difficulty.

Dealing then with the minor groups of industry, we again encounter technical difficulties in the presentation of uniform accounts, and possibly the principal cause for this lies in the differing natures of the raw materials of each firm's saleable products. Possibly one of the best examples which may be cited is that of the copper industry. In this industry there are factories whose raw material is the ore, in others the ingot, in others again the first rolling from the ingot, while another group will use large diameter rod, or heavy sheet, working this up into their saleable products. Others, again, such as electric cable makers, carry out a number of the processes of copper wire drawing, and apply to them other raw material such as bitumen, india-rubber, cotton, paper and the like, producing a finished article in which are combined not only the processes inherent to the copper trade itself, but others which are allied to the processes employed in totally different industries. Again, in the waterproof garment trade, one

factory will work up material which is already dyed and proofed, others will carry out their own dyeing, sending the work out to be proofed, subsequently working it up, alternatively carrying out the dyeing and proofing themselves. Others, again, will carry out the making and sewing in their own factory, while the practice of others is to contract with home workers for a considerable amount of their work.

Other factors which vary with different concerns in the same trade include methods of finance, of distribution, and of production, but as will be shown later, such difficulties are not insuperable, and by agreeing upon certain standards of principle, a measure of uniformity is achievable.

A great deal of work has been done already in certain industries towards agreement upon standard methods of costing and, encouraged by the success in these instances, other trade associations will doubtless be able to overcome the difficulties inherent to such questions as to what constitutes raw material, and as to segregating the costs of the product at different stages of its manufacture, but a further difficulty lies in their path if attempts are made to introduce standardized systems. A system with its blank forms, its analysis sheets, and its statistical returns, is merely a mechanical reminder. It is the mechanism of a procedure which has been agreed upon by the individuals concerned, who have decided that the presentation of certain results is essential to the good conduct of their business. The mechanism by means of which these results are obtainable is a matter of minor importance, a matter of detail which may be well left to each individual to devise according to his own particular local circumstances. To illustrate the difficulty of standardizing a system, it is only necessary to consider the simple case of time recording. In a very small factory a time note, giving the details of all the work performed during the week, which time note is signed or even in some cases made out by the foreman, may be perfectly satisfactory, both for the compilation of a pay roll and a calculation of job costs, if the foreman be in close enough contact with his men to ensure the accuracy of these returns. But in a factory employing 1,000 men it becomes necessary not only to have separate cards on which a man records his presence in the factory, which cards are used for the compilation of the pay roll, but it is also necessary to have job cards for each individual operation, and these may be made out by a time clerk, by the man himself, or may be recorded on a time recording clock, or by means of other

mechanism. It is a matter of indifference how this work is carried out, so long as the results desirable in accordance with principles are obtained. Due to the nature of the process great differences in system may occur in two factories producing the same article. Thus, we may have inside one factory, bulk or process costing for intermediate products, and operation or detail costing for the final saleable products which are made up of different intermediate products. Another factory, producing only a few of the range of products of the first, may, on the other hand, carry bulk or process costing through to the completion of the finished product. Indeed, it is just at this point where it appears very necessary to come to some agreement in regard to the definition of the principal terms used in cost accountancy.

A cost must always be complete in itself, and the calculation of the true cost of production, which is a final quantity, appears to be possible by the adoption of standardized principles, but it is obvious that in the obtaining of these results the systems employed need not, and indeed cannot, be uniform in the majority of industries.

Having shown the basic differences which make uniformity of costing difficult even in one trade or branch of industry, and having shown the relative unimportance of the standardization of systems, it remains to show that there are certain principles of good cost accountancy which, if adopted, will enable any group to agree upon a standardized method of presenting their results once they have agreed upon certain fundamentals. These fundamentals should include—

(a) The definition of what are to be considered "raw materials" of each branch of the trade, and the method to be employed in segregating the costs, so that comparable figures are available for the man who purchases the raw material for certain processes, and for the man who manufactures these intermediate products in his own factory.

(b) The basis or unit for the purpose of comparing cost accounts; thus the unit may be the actual product in the case of articles which are sold as separate units, the square box as in the biscuit trade, the ton as in the sulphuric acid and coal industries, the gross as in certain metal trades, the kilowatt hour as in electricity supply, the therm as in gas supply, and the ton-mile as in the transport trade. Other units for the purpose of comparison will suggest themselves to particular trades.

(c) The extent to which the financing of the trade is to enter into the cost accounts.

(d) The separation of distribution from manufacturing expense.

Having agreed upon these fundamentals, the adoption of the following principles will enable industries to go a very long way towards the standardization of cost accountancy to meet their own particular needs, and should, in the majority of trades, achieve their object irrespective of the systems applied. These principles are—

1. That cost accounting must be based upon actual returns, namely, labour costs, material costs, and establishment costs.

2. That there are three fundamental cost accounts for all industries, viz., Wages Control Account, Material Control Account, and Establishment Expense Control Account.

3. That being based on actual expenditure, and results being given in terms of cash, the cost accounts must link up with and balance the financial accounts.

4. That cost accountancy distinguishes between factory cost, selling expense, and general administrative expense, and that each of these should be complete in itself and should be controlled separately to enable the directorate to observe the incidence of profit or loss.

5. That in all industries distinction can be drawn between the standing charges and running charges. That for all industries the former can be divided into rent expense, administrative or management expense, and fixed charges ; that all the latter will be included in some, if not all, of the following—

Repairs and maintenance expense, indirect labour, power expense, factory supplies, inter-departmental service expense, and material expense.

The subdivision of these accounts may be different for each industry, with minor subdivisions for each trade.

6. That cost accountancy distinguishes between detail or product costing and bulk or process costing.

7. That in introducing cost accounting the successive steps should be—

(a) Simple recording of time and material.

(b) The calculation of establishment expenses and their control.

(c) The apportionment of expense and its control.

(d) The linking up with financial accounts.

These constitute the major principles. There remain

certain minor principles where divergence of practice is possible, and these are as follows—

1. That work chargeable to plant extensions, or to any of its subdivisions, should bear its properly calculated share of expense, in that the Capital Account purchases through the cost accounts from the factory, and that unless expense be so charged, the factory products suffer in regard to enhanced cost of production to the advantage of the capital assets.

2. That interest on capital to be expended must always be considered when *estimating* the cost of new processes or products, but that in the actual cost accounts no interest on capital invested should be included.

3. That the factory when not working to full capacity should only be debited with that portion of the standing expense charges which correspond to the volume of its activity, and that the balance should be shown as a separate debit item, namely, the cost of idle time, in order to retain a sound basis for continuous comparison of factory efficiency, and to indicate to directors the loss due to lack of volume of work, which loss must be recovered by increase of sales or in the margin of profit on sales.

It is quite realized that the subject introduced is far too great to be adequately dealt with even in several volumes. One great need of industry in this country at the present time is the introduction of cost accountancy, not by amateurs, but by properly qualified men, who, with the encouragement and assistance of all those engaged in the industry, will be able to produce results which will enable the directorate to control their businesses scientifically and efficiently, and thus produce commodities on the most economical basis. This should undoubtedly build up the trade of the country, and tend to eliminate those periods of depression and unemployment, which were such a feature of our economy in the past. There has been so much amateur work hitherto by persons, who, though they are well disposed, do not recognize their ignorance of the principles of cost accountancy, that the introduction of a costing system instead of proving beneficial to a business, has resulted simply in more waste.

UNIT OF MEASUREMENT. The employment of any method of cost finding requires that a unit of measurement or output be used. Output has to be measured: the cost of the output may have to be reckoned by the piece, pound, dozen, barrel, yard, article, etc., and by taking one of these classifications and using arithmetical figures, the total can be obtained.

In some trades, the unit might be the article or batch or articles produced, a piece of machinery, a complete job or order as in an engineering works or a general repair shop and, in some cases, in foundries. The unit in the case of builders or contractors would be the complete job or contract. An electric supply company would require the Board of Trade unit or Kilowatt hour. In other trades, the unit may be related to the process as with chemicals, tanning of leather, flour, bricks and cement, etc.

Several units of measurement may be required in the plant, depending upon the nature of the industry carried on and the method of Cost Finding in use. For instance, in dealing with Establishment Expenses, an Expense Rate has to be used as a unit or basis of calculation when recovering expenses in costs. The expense rate is the measure used for ascertaining the proportion of expense that is to be charged to a particular process, operation, article, or order. The measure used may be a percentage rate or a rate per unit, such as per article, per hour, per pound, etc., and the method of arriving at such a rate is determined by the basis upon which the establishment expenses are recovered in costs and which may be one or a combination of the following—

1. Percentage on Direct Labour.
2. " " Prime Cost.
3. Departmental Rate.
4. Direct Labour Hour Rate.
5. Machine Rate.
6. As a rate per article dispatched and invoiced to customers.
7. As a percentage on the works cost of goods dispatched to customers.
8. As a percentage on the sales value of goods dispatched to customers.

Unit of Manufacturing Cost. The unit of cost is the basis for computing all costing data so that it is possible to compare the cost of one or a batch of articles or one process with another. The selection of the correct unit is very important, as incorrect or unsuitable units will render the cost returns misleading.

For instance, a laundry which is operated by a plant for the washing of overalls and coats, etc., may use the unit per employee for costing purposes, it being claimed that as the laundry is used solely to wash the employees' overalls, etc., that it is only logic to calculate the cost at a rate per employee. A little

reflection upon this point will soon show that such a unit would give misleading costs as the "employee" is not the correct measurement. Some employees may use two overalls per week and others only one, whereas a few may not use any overalls or caps. The correct unit of cost in such cases should be the lb. This instance will serve to show that an incorrect unit of cost will be very misleading.

The nature of the articles or products made will to a large extent determine the unit to be used, but it frequently occurs that two businesses manufacturing similar articles will each use a different unit of cost. A business making an article in small quantities may calculate their costs at a rate per article, whereas another concern making a similar article, but in very much larger quantities, may analyse their costs at a rate per operation. For instance, a concern manufacturing say, motor cars to individual requirements and whose output may amount to one or two cars per week, may calculate their costs on a "per car" basis, and this may be quite suitable for their requirements as no two cars may be alike. Another concern producing cars on a mass production basis would require to show their costs in much greater detail, hence the probable use of the unit per operation, etc.

A number of different units of cost will generally be used in the same plant as the nature of the product and the method of manufacture will require that the various items be treated differently. In an engineering plant the machine shop will need a separate unit for each different operation, for instance the output from a screw cutting lathe may have to be measured according to the size and pitch of the thread, or on a machine hour basis. A multiple drill may be measured according to the diameter and depth of the holes or if the product is standardized the unit may be the drilling operation.

Unit of Service Department Costs. With practically all manufacturing plants there are departments that are not directly engaged upon the actual making of the products but which render a service to all or some of the manufacturing departments. These departments are called Service Departments and the work they perform must be costed in a similar manner to the producing departments. A unit of measurement is necessary for the computation of their costs and each of these departments will require a different unit, according to the nature of the service they render.

The Power Department is an example of a service department and their duties may be the generation and supply of

the various kinds of power used by the producing departments. In the case of electricity the cost of generating the current would be calculated at a rate per Kilowatt Hour. The unit, therefore, in this case is the Kilowatt Hour and all the electricity used by each department would be charged to them at a rate per Kilowatt Hour.

With most factories steam is used for various purposes, such as for heating, drying, baking, etc., in addition to being used for motive power, and the unit of cost that would be used to calculate the cost is per 1,000 lb. of steam raised or per 1,000 lb. of water evaporated. The supply of steam for, say, heating purposes would, therefore, be charged to each plant and office department on the basis of per 1,000 lb. steam used. In some cases the cost of heating is calculated on the basis of per foot of radiation.

UNPRODUCTIVE LABOUR. (See INDIRECT LABOUR.)

VARIABLE EXPENSES. The indirect expenses of a business which fluctuate with the volume of output or amount of work done, such as indirect labour, indirect materials, power, light and heat, repairs and maintenance, charges for water, sundry works expenses, works clerical assistance, salaries, commissions on sales or output, stationery, etc. (See also ESTABLISHMENT EXPENSE.)

WAGE INCENTIVE. This is a plan whereby labour is paid wholly or in part in proportion to its production or savings in time.

The effect of a properly administered wage incentive is remuneration commensurate with productivity for the worker and minimum per unit labour cost for the management.

The development of wage incentives has been difficult and contentious. Following F. W. Taylor's introduction of payment on a definitely scientific basis, many schemes were advanced. Some of these were not well-conceived and failed in application, principally because close co-ordination of proper evaluation motion study and time study was lacking.

In the light of successful experience, incentive plans are much alike. Basically, reward must be commensurate with effort expended; there should be a guaranteed minimum wage; the calculations entailed on part of worker and clerical staff should be simple and direct; the effect of bonus for extra effort should be immediate; are the conditions characteristic of a successful wage incentive?

The contentious element of any plan is the determination of the "standard," the basic figure by which production effort

is translated into monetary reward. The rate setter must have the confidence of both worker and management as to his knowledge, ability, and "good faith" interpretation of "a fair day's pay for a fair day's work."

The installation of an incentive plan follows a logical sequence of development—

(a) Equitable base rates: the value of any occupation with reference to all other occupations in the plant should be established. (See JOB EVALUATION.)

(b) The basis of promotion, seniority rights, and quality of workmanship rewards should be clearly defined. (See MERIT RATING.)

(c) The most economical procedure for performing the operation should be investigated and established. (See MOTION STUDY.)

Finally, the actual "Standard of Production" in time or price allowance for the performance of the task to the personal qualifications, as discovered by Merit Rating under the procedure established by Motion Study, is readily determined by Time Study.

There is a great variety of methods and incentive plans. Some of these are elaborate with a complexity of factors; others are simple, such as straight "Piece Rate."

A partial list of different methods of paying labour by incentive appears below, and a description of each appears under its respective heading. There are innumerable variants of these plans to adapt them to the particular requirements of various industries and plants.

1. Time rates or day work, day wage, time work, day rate.
2. Piece work, piece rate, straight piece rate.
3. Halsey premium.
4. Rowan premium.
5. Barth premium.
6. Taylor differential piece rate.
7. Merrick differential or multiple piece rate.
8. Gantt task and bonus.
9. Emerson efficiency bonus.
10. Knoeppel bonus.
11. Diemer combined bonus and premium.
12. Ficker (a method of sharing savings in time and expense).
13. Cost premium.
14. Reference rate.
15. List percentage plan.
16. Priestman system.

17. Contract system.
18. Co-partnership and profit-sharing.
19. Bedaux system.

WAGES ABSTRACT. (For description and illustration of form, see TERMINAL COSTING ; also LABOUR COST COLLECTING SHEET.)

WAGES ANALYSIS. (See PAY ROLL, also SERVICE ORDERS.)

WAGES BOOK. (See PAY ROLL.)

WAGES CARD. (See GATE CARD.)

WAGES CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

WAGES DIRECT. (See DIRECT LABOUR.)

WAGES INDIRECT. (See INDIRECT LABOUR.)

WAGES AND MATERIAL SUMMARY. (See COST SUMMARIES.)

WAITING TIME. (See UNALLOCATED TIME, also SERVICE ORDERS.)

WASTER NOTES. (See REJECTION NOTE, also INSPECTION CERTIFICATE.)

WORK IN PROGRESS CONTROL ACCOUNTS. (See COST CONTROL ACCOUNTS.)

WORK SIMPLIFICATION. (See MOTION STUDY.)

WORK TICKET. A written instruction containing full particulars of the quantity and nature of work to be performed against a works or production order.

A separate work ticket may be issued for each operation and for each worker engaged on a production order, or one ticket used for a series of operations to be performed on the same order.

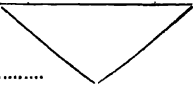
A specimen work ticket is shown on page 480, which is issued for each operation or batch of work performed by the individual worker. A work ticket provides the Cost Department with information regarding the amount or quantity of work done by each worker, which forms the basis of computing the amount of piece work or bonus earnings when calculated in conjunction with the times as shown on the worker's job card. At the bottom of the form are spaces for noting the quantities completed (i.e. "in," which refers to the quantity passed into the Inspection Department or view room), and the quantities that have passed inspection. It will be noted that the above form is a combined instruction and inspection ticket.

With those industries where standard products are made,

Form No. 116.

WORK TICKET					No.
Operation to be done.		Date Required.	To Department.		Order No.
No.	Description.	Operator—			Machine No.
OUT		PART AND DRAWING No.			
		In.		Passed.	Checked.
Signature					Recorded by Progress Dept.
Date					
RETURN WITH WORK TO INSPECTION DEPARTMENT AS SOON AS POSSIBLE.					

Form No. 117.

WORK TICKET		WORKS ORDER No.			
<div style="display: flex; justify-content: space-between;"> <div>NAME.....</div> <div style="text-align: center;">  </div> </div>					
<div style="display: flex; justify-content: space-between;"> <div>Clock No.....</div> <div>Date.....19.....</div> </div>					
Component.....					
<div style="display: flex; justify-content: space-between;"> <div>Drg. No.....</div> <div>Symbol No.....</div> </div>					
OPERATION.	Quantity	Passed	M/c. Scrap	Metal Scrap	Inspd. by
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
<p>This ticket to be issued with material and to remain with job till completed.</p> <p>After each operation, work and ticket to be sent to Inspection Department. After final test, work ticket to be returned to Planning Department.</p>					
Issued by.....	Issued to		View Room.....		
Date.....					
Date first operation commenced.	Date last operation finished.		Planning Department.		

it is sometimes more convenient to issue one work ticket to cover a series of operations that have to be performed on the same article. The work ticket in this instance will differ from that described above, as more space will be required for noting the various operations. A specimen form is given on page 481, from which it will be noted that provision is also made for the viewing of the work at the end of each operation.

A work ticket may not always be necessary, as particulars of the quantity and nature of the work to be done can often be inserted on the job card, and for a description of this method see **BOOKING TIME TO JOBS—METHODS OF.**

WORKER'S TRANSFER NOTE. The form used for notifying the wages section of the Cost Department of the transfer of a worker from one department to another or change in occupation, or of a clock number or check number.

The transference of workers from one department to another must be notified to the wages section, so that the personal records of each worker can be altered accordingly. When the pay roll is arranged upon a departmental basis, the worker's name will require to be removed from amongst those of his late department and entered upon the sheets of his new department. The change in clock or check number will also necessitate an alteration in the pay roll if all employees are entered in sequence of clock numbers.

An illustration of a worker's transfer note is given (Form No. 118), the ruling of which is self-explanatory. The worker who is to be transferred would be handed a transfer note, and upon arrival at his new department would hand the note to his new foreman, who in turn would then pass it to the wages section of the Cost Department.

It should be noted that "loaned" workers must be dealt with quite differently to those who are permanently transferred from one department to another. In the case of workers temporarily loaned to another department, it is usual for them to book their time to an "other department service order," and the time so allocated, together with a charge for expenses, debited to the department receiving the benefit of their labour.

WORKS CHARGES. (See **FACTORY EXPENSE.**)

WORKS COST. (See **FACTORY COST.**)

WORKS EXPENSES. (See **FACTORY EXPENSE**, also **ESTABLISHMENT EXPENSE.**)

WORKS FIXTURES AND FITTINGS consist of benches, racks, bins, desks, shelving, also partitions, etc., when not

WORKER'S TRANSFER

DATE

DEPT.....

Please confirm your agreement to transference of.. .. .

Clock No..... Trade from this department to department.

Remarks :

RECEIVING FOREMAN.

TRANSFER APPROVED BY

Clock No.

Worker's Trade.

Signature.

.....
Works Manager.

NOTE TO RECEIVING FOREMAN--

If accepted in a trade different from above, state in what capacity worker will be employed.

THIS FORM MUST BE SENT TO COST DEPARTMENT IMMEDIATELY WORKS MANAGER'S APPROVAL IS OBTAINED.

forming part of the main building. The value of works fixtures is part of the capital assets of the business. The cost of keeping such assets in good repair is a charge to the Factory Expense Account, and the amount apportioned or allocated direct to each department when departmentalization of expenses is necessary. If the maintenance and repair expense is large, the cost is collected through a system of service orders, which will show the amount of expense incurred by each department separately. With small concerns, however, it is usually sufficient to regard all works fixtures as forming part of the main building, and to include the cost of any repairs among the building expense. (See also **FIXTURES AND FITTINGS.**)

WORKS MANAGER—SALARY OF. In the majority of cases the amount of salary paid to a works manager will be directly allocated to factory expenses, but with some concerns this official may perform other duties besides those which relate to purely factory management.

With very small businesses the works manager may be responsible for the general management and control of all departments, and in such cases his salary should be apportioned over the various sections of the business. With the large concerns, and in those instances where his duties and responsibilities are confined to the factory, the salary is allocated direct to factory expenses.

WORKS ONCOST. (See **FACTORY EXPENSE.**)

WORKS OVERHEAD. (See **FACTORY EXPENSE.**)

